A-LUCAS
41-1

SCHEMATIC AND BLOCK DIAGRAMS OF RADIO RECEIVERS BC-342, R-174/URR, & R-390/URR

THE SOUTHEASTERN SIGNAL SCHOOL
Camp Gordon, Georgia

11-E-12/10-D
Army Ft McPherson Ga 955/54

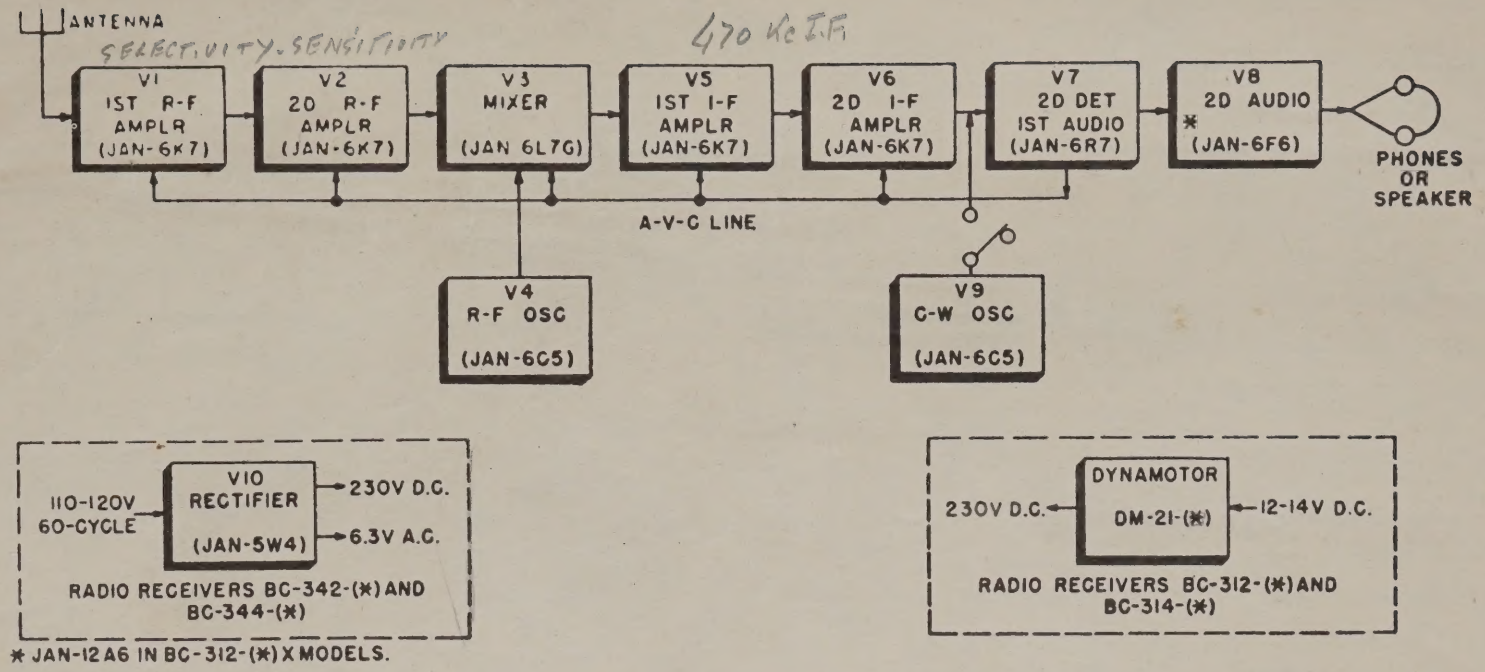
JULY 1954

THE SOUTHEASTERN SIGNAL SCHOOL
Camp Gordon, Georgia

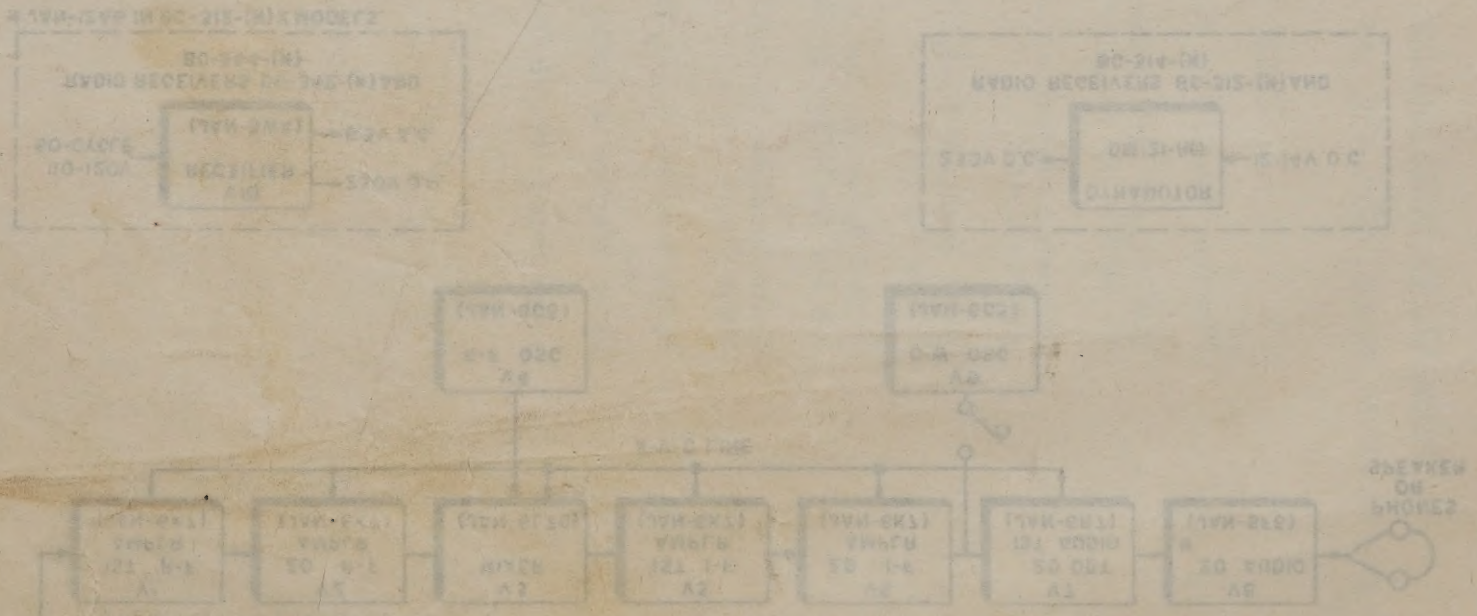
SCHEMATIC AND BLOCK DIAGRAMS

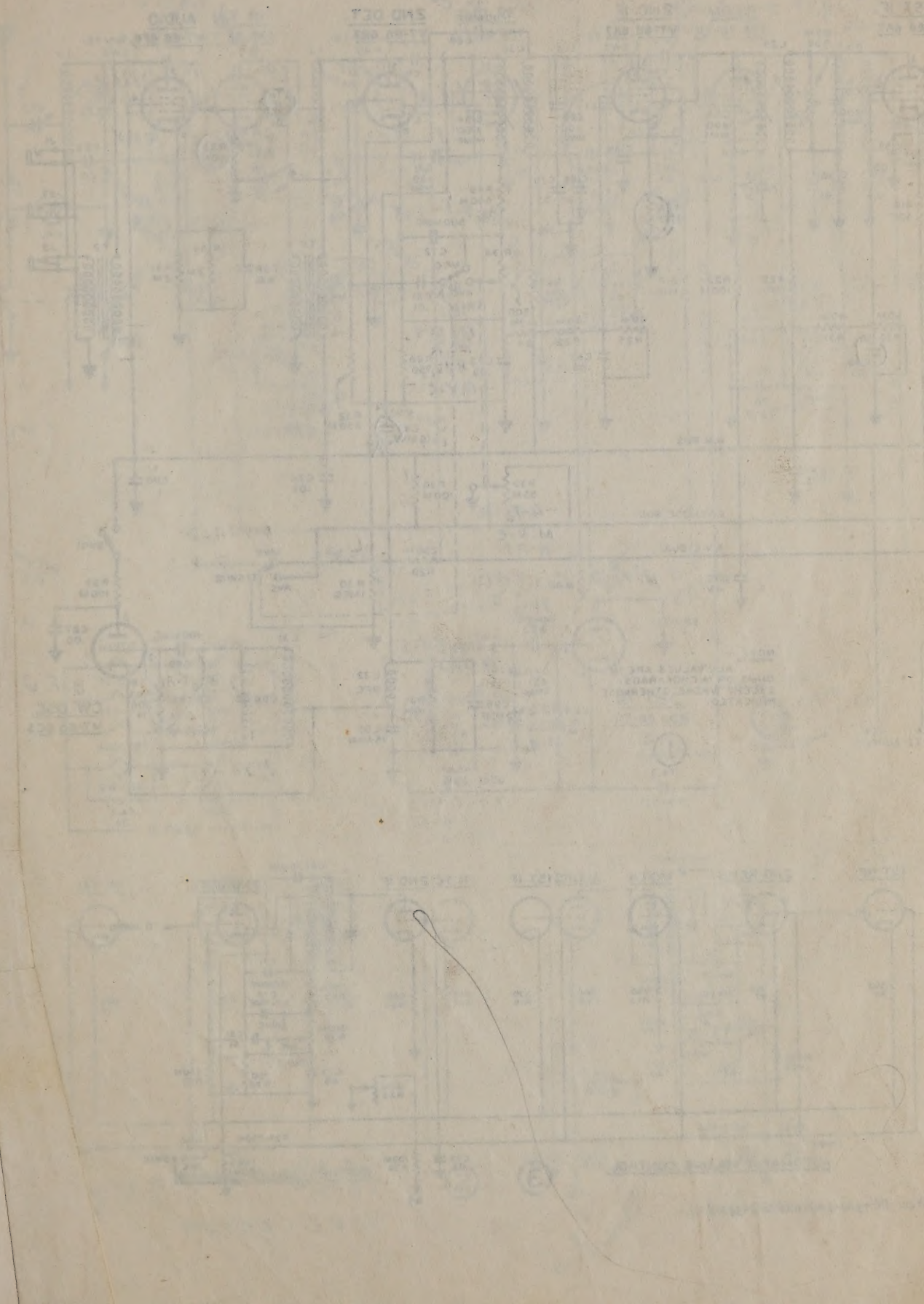
RADIO RECEIVERS BC-342, R-174/URR, AND R-390/URR

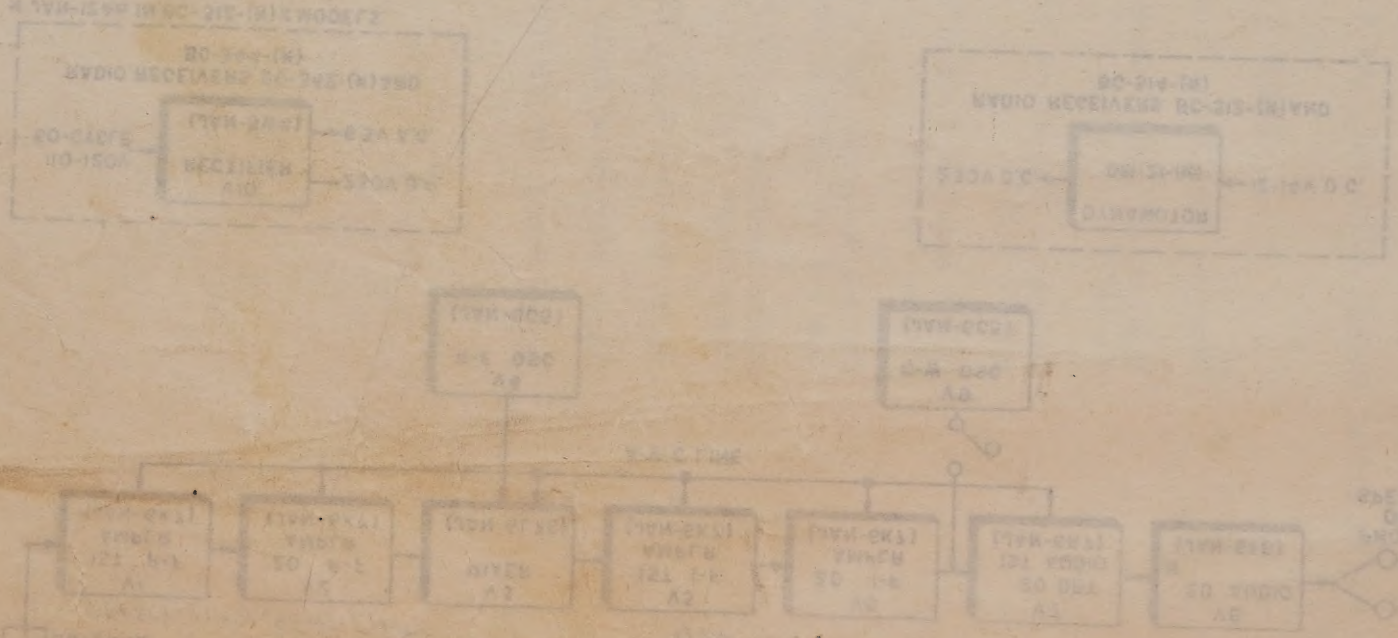
NUMBER	TITLE
1	Receiver Simplified Block Diagram
2	Simplified Circuit Diagram of Radio Receivers BC-312(*) and BC-342(*)
3	Schematic Diagram of Radio Receivers BC-312(*) and BC-342(*)
4	Radio Receiver BC-342(*), Simplified Crystal Filter Circuit
5	Second Detector, 1st A-F Amplifier, AVC and 2nd A-F Amplifier of Radio Receiver BC-342(*)
6	Radio Receiver BC-342(*), Voltage and Resistance Chart
7	Radio Receiver R-174/URR, Block Diagram
8	Block Diagram of Radio Receiver R-390/URR
9	Power Supply PP-308/URR, Block Diagram

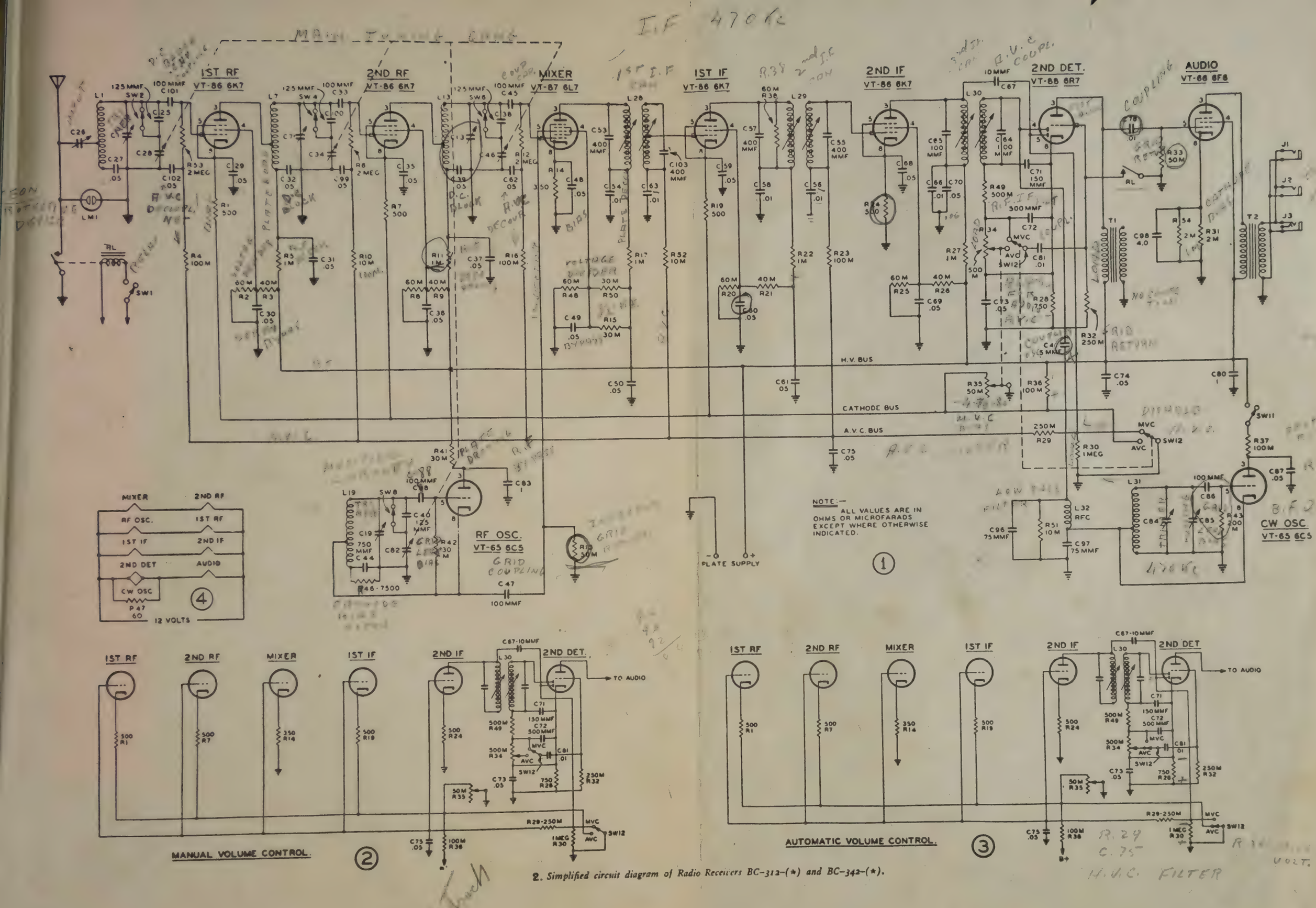


1. *Receiver simplified block diagram.*









2. *Simplified circuit diagram of Radio Receivers BC-312-(*) and BC-342-(*).*

1ST RF
VT-88 6K7

2ND RF
VT-88 6K7

MIXER
VT-87 6L7

1ST IF
VT-88 6K7

2ND IF
VT-88 6K7

CRYSTAL FILTER USED IN BC-312-(*) MODELS TO & INCLUDING BC-312-J & ALL BC-342-(*) MODELS.

IF
470 KC

CRYSTAL PHASING

RF OSC.
VT-65 6C5

CW OSC.
VT-65 6C5

2ND DET.
VT-88 6R7

AUDIO
VT-66
6F8

VT-134 IN BC-312 NX & NX MODELS.

EXCEPT ON BC-312-M, NX & BC-342-(*).

R58 IS USED ON BC-312-L, M, N & NX MODELS. CONNECTION ON OTHER MODELS.

NOT USED IN BC-312-(*)X

AVC BUS

CATHODE BUS

H.V BUS

AUDIO DISABLING IN NX, M, N & NX MODELS

BAND CHANGE

MAIN TUNING

SIG ANT

ALIGN INPUT

GND

PHONES

SPEAKER

MICRO

SEND

REC'D

COIL OF RL1

CONNECTION STRIP

SO1
PIN VIEW

NOTE
ALL VALUES ARE IN OHMS OR MICROFARADS UNLESS OTHERWISE INDICATED.

TYPICAL PLUG SO1 CONNECTIONS
DC OPERATION.

PIN:
D FILAMENT-12V
T FILAMENT+12V
E MIC RING
M SIDE TONE
J SEND-REC RELAY
N KEY TIP
V MIC TIP

D, T → COMMON
E, M → COMMON

AC OPERATION.

PIN
D FILAMENT
T FILAMENT } 12V AC
ALL OTHER CONNECTIONS REMAIN AS IN DC OPERATION

MIXER 2ND RF 1ST RF RF OSC
2ND IF 1ST IF CW OSC 2ND DET
AUDIO
R53 75
24 VOLTS

TUBE HEATER CIRCUIT BC-312-( )
X MODELS ONLY

TUBE SOCKET TERMINALS, BOTTOM VIEW

DM-17-( ) OR DM-21-( ).

NOTE
CONNECTIONS SHOWN FOR DM-17-( ) OR DM-21-( ) USED IN BC 312-( ) MODELS

DYNA-MOTOR

TERMINAL BOARD

FILTER FL-6-( )

CONNECTION STRIP IN RECEIVER

RECTIFIER
VT-97 SW4

RECTIFIER RA-20

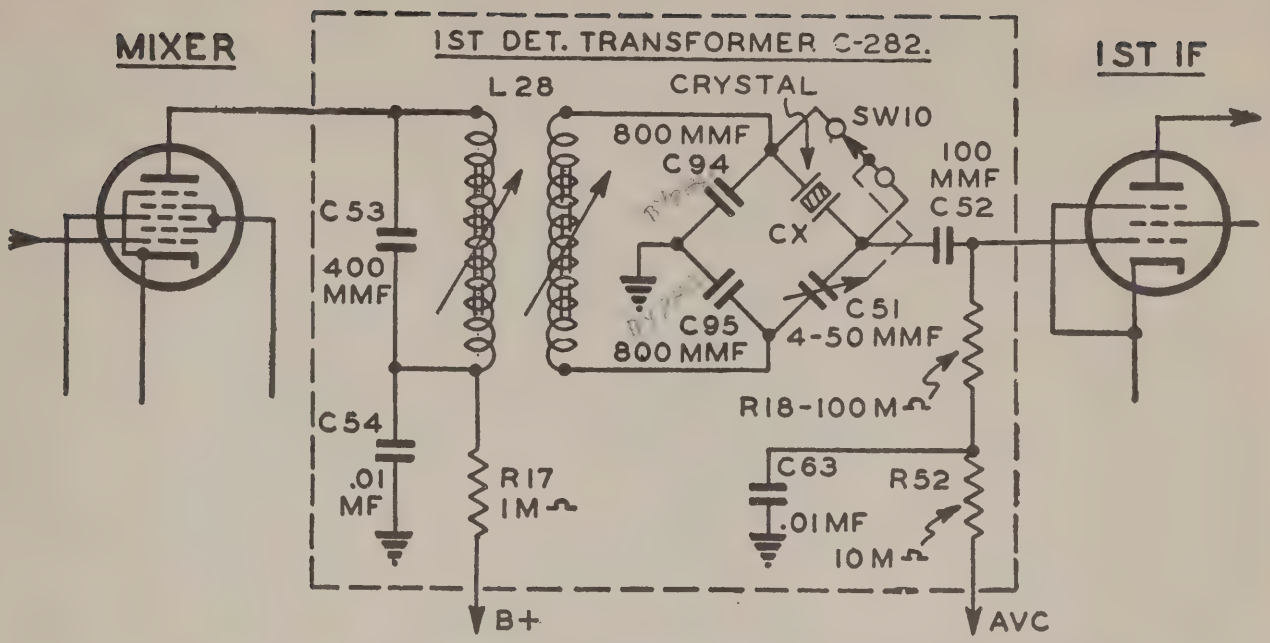
NOTE
THIS RECTIFIER USED IN BC-342-( ) MODELS

T3

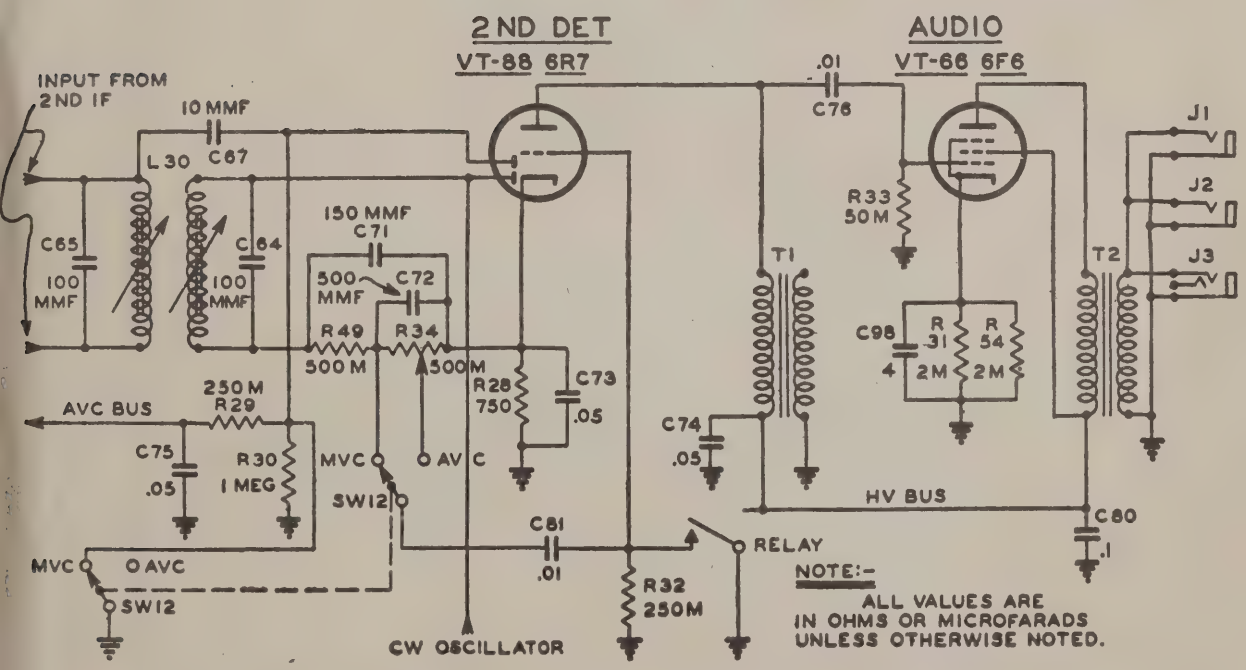
TERMINAL BOARD

A-C RECEPTACLE

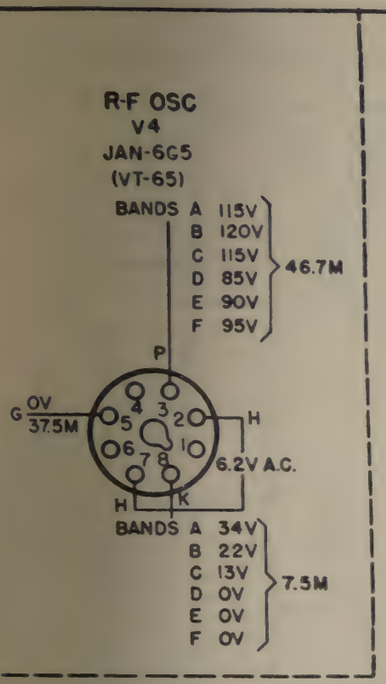
3. *Schematic diagram of Radio Receivers BC-312-(*) and BC-342-(*).*

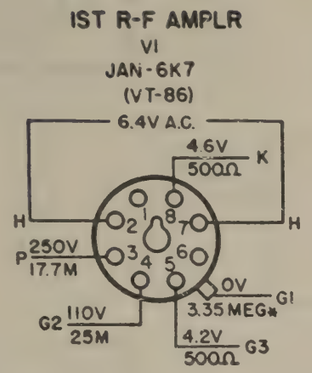


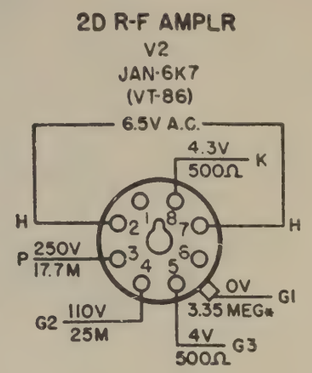
4. Radio Receiver BC-342(*), Simplified Crystal Filter Circuit

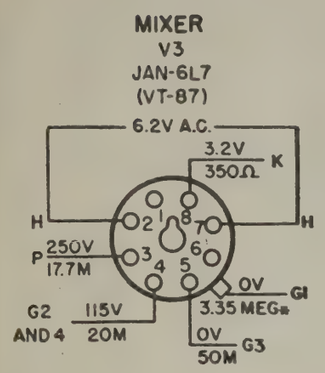


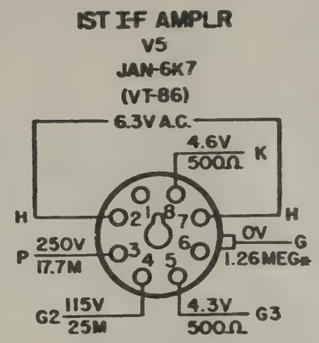
5. Second Detector, 1st A-F Amplifier, A-V-C and 2nd A-F Amplifier of Radio Receiver BC-342(*)

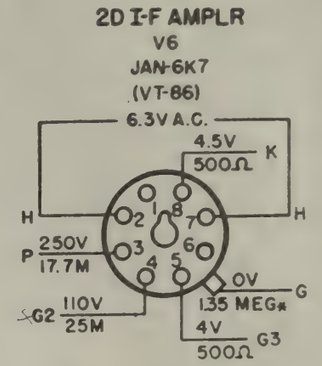


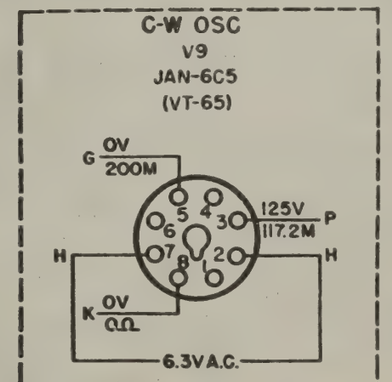


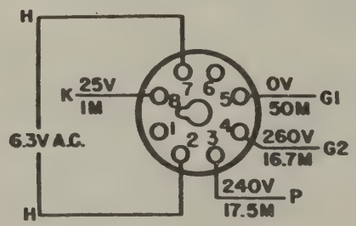


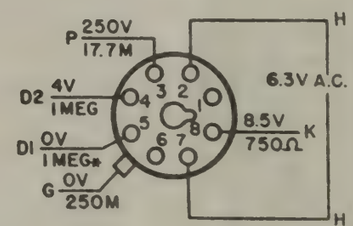












NOTE: ALL MEASUREMENTS MADE WITH OFF-M.V.C.-A.V.C. SWITCH IN M.V.C. POSITION, VOL CONTROL AT MAXIMUM CLOCKWISE POSITION, AND C.W.-OSC. SWITCH IN ON POSITION (BAND A) UNLESS OTHERWISE NOTED.

ALL VOLTAGE MEASUREMENTS ARE D.C. MADE TO GROUND (UNLESS OTHERWISE NOTED) WITH A 1,000 OHM-PER-VOLT METER FROM TOP OF CHASSIS WITH ALL TUBES IN PLACE. (TO MEASURE VOLTAGE, BARE BOTH ENDS OF A PIECE OF INSULATED WIRE, REMOVE TUBE AND WRAP ONE END OF WIRE AROUND DESIRED PIN, REPLACE TUBE AND CHECK VOLTAGE AT EXPOSED END OF WIRE.)

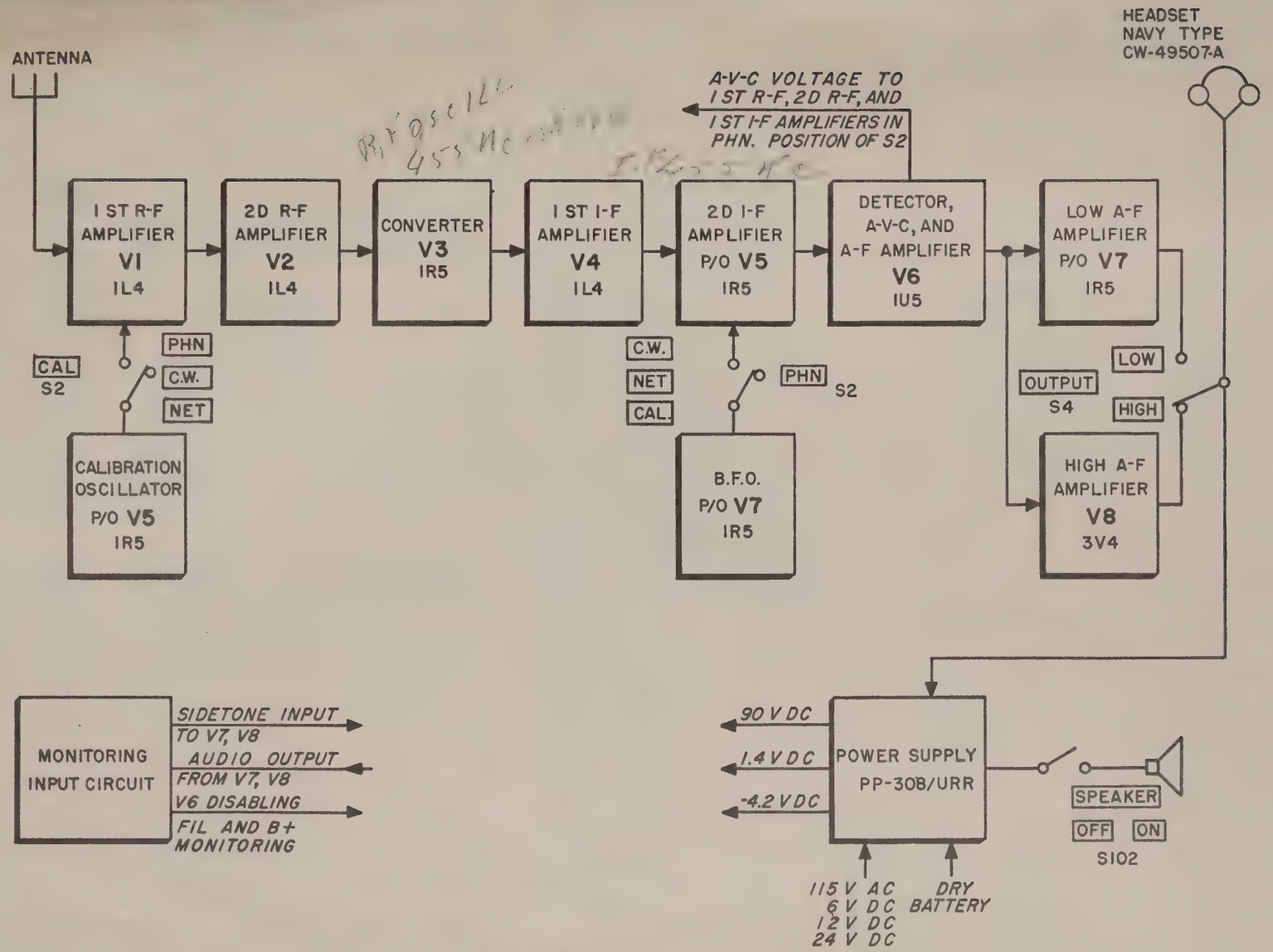
ALL RESISTANCE MEASUREMENTS MADE TO GROUND WITH POWER TO THE RECEIVER TURNED OFF.

* OFF-M.V.C.-A.V.C. SWITCH IN A.V.C. POSITION FOR THESE MEASUREMENTS.

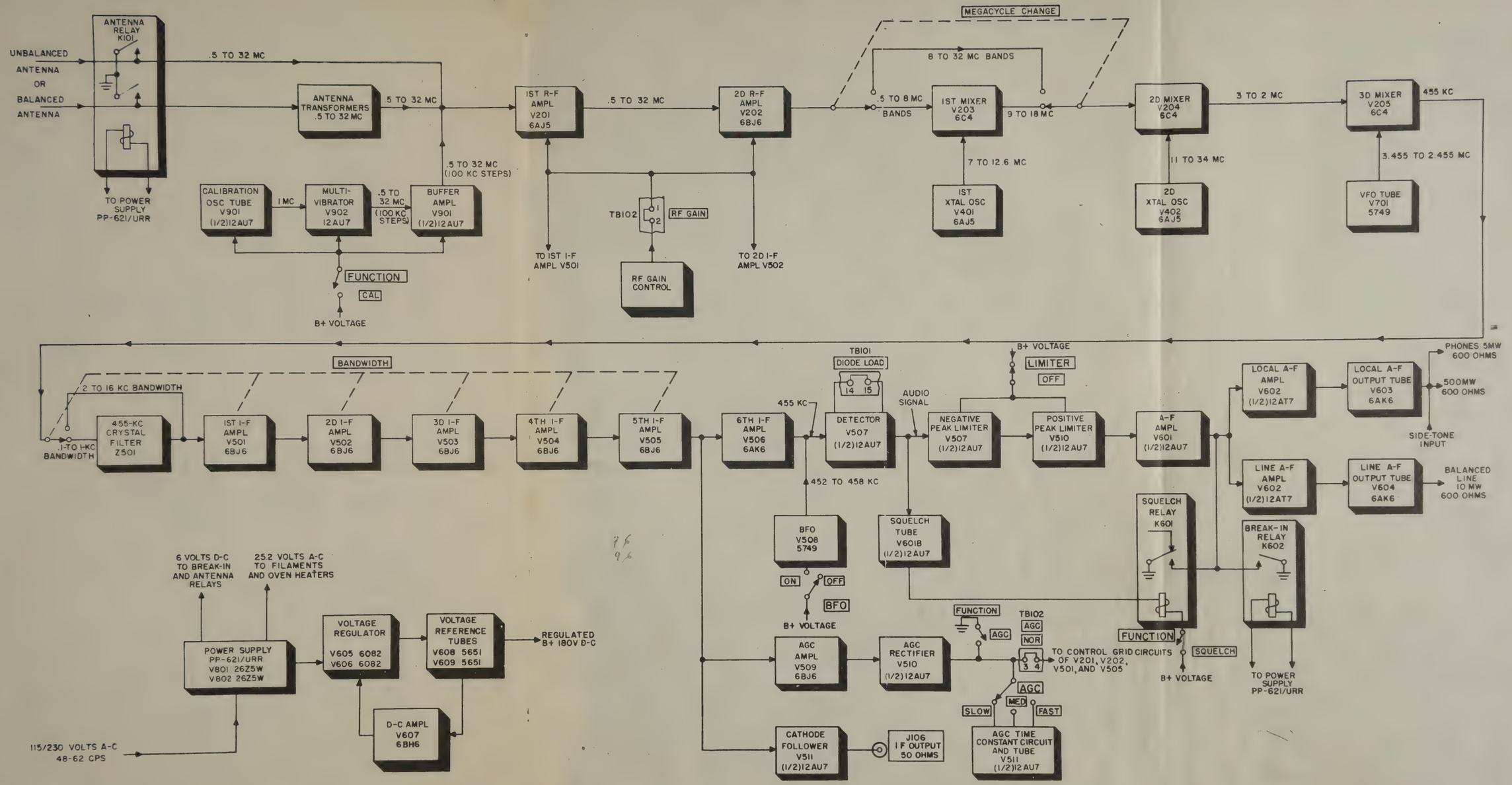
NOTE: M=1,000Ω

FRONT PANEL

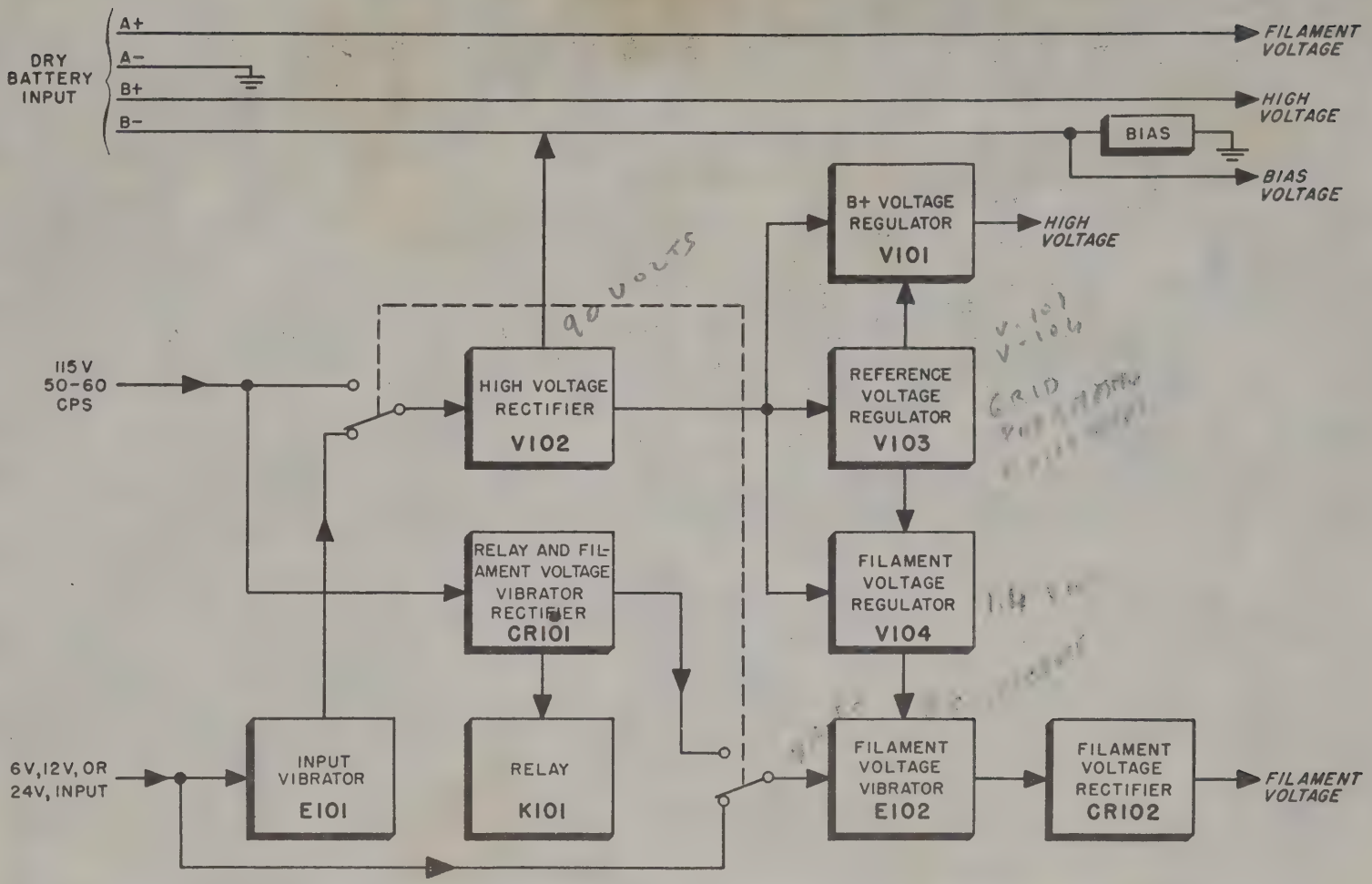
6. Radio Receiver BC-342-(*), voltage and resistance chart.



7. *Radio Receiver R–174/URR, block diagram.*



8. BLOCK DIAGRAM OF RADIO RECEIVER R-390/URR



9. *Power Supply PP–308/URR, block diagram.*

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SCHEMATIC DIAGRAMS OF PORTABLE A-M FIELD RADIO SETS

THE SOUTHEASTERN SIGNAL SCHOOL

Camp Gordon Georgia

11-E-12/9-D

Army Ft McPherson Ga 1383/54

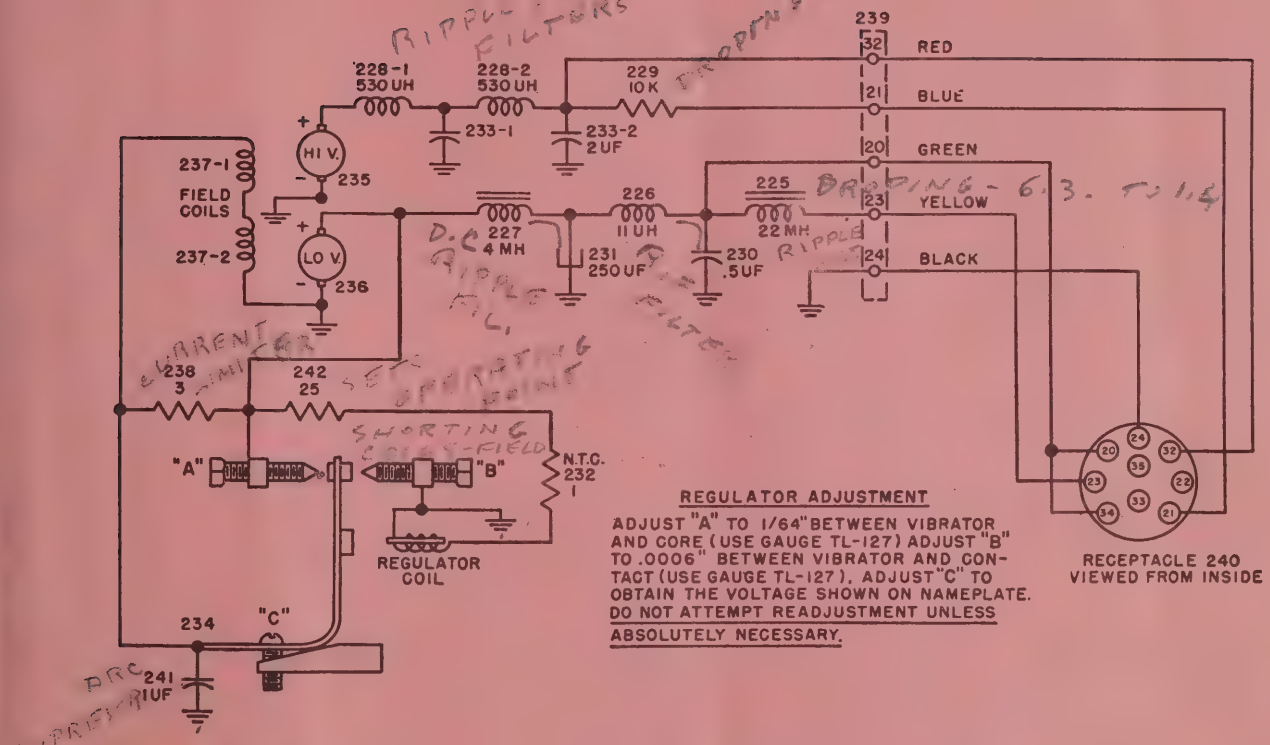
AUGUST 1954

THE SOUTHEASTERN SIGNAL SCHOOL
Camp Gordon, Georgia

SCHEMATIC DIAGRAMS

PORTABLE A-M FIELD RADIO SETS

NUMBER	TITLE
1	Generator GN-58, Schematic Diagram
2	Receiver Section of Receiver-Transmitter RT-77/GRC-9, Schematic Diagram
3	Transmitter Section of Receiver-Transmitter RT-77/GRC-9, Schematic Diagram
4	Vibrator Power Unit PE-237, Schematic Diagram



REGULATOR ADJUSTMENT

ADJUST "A" TO 1/64" BETWEEN VIBRATOR AND CORE (USE GAUGE TL-127) ADJUST "B" TO .0006" BETWEEN VIBRATOR AND CONTACT (USE GAUGE TL-127). ADJUST "C" TO OBTAIN THE VOLTAGE SHOWN ON NAMEPLATE. DO NOT ATTEMPT READJUSTMENT UNLESS ABSOLUTELY NECESSARY.

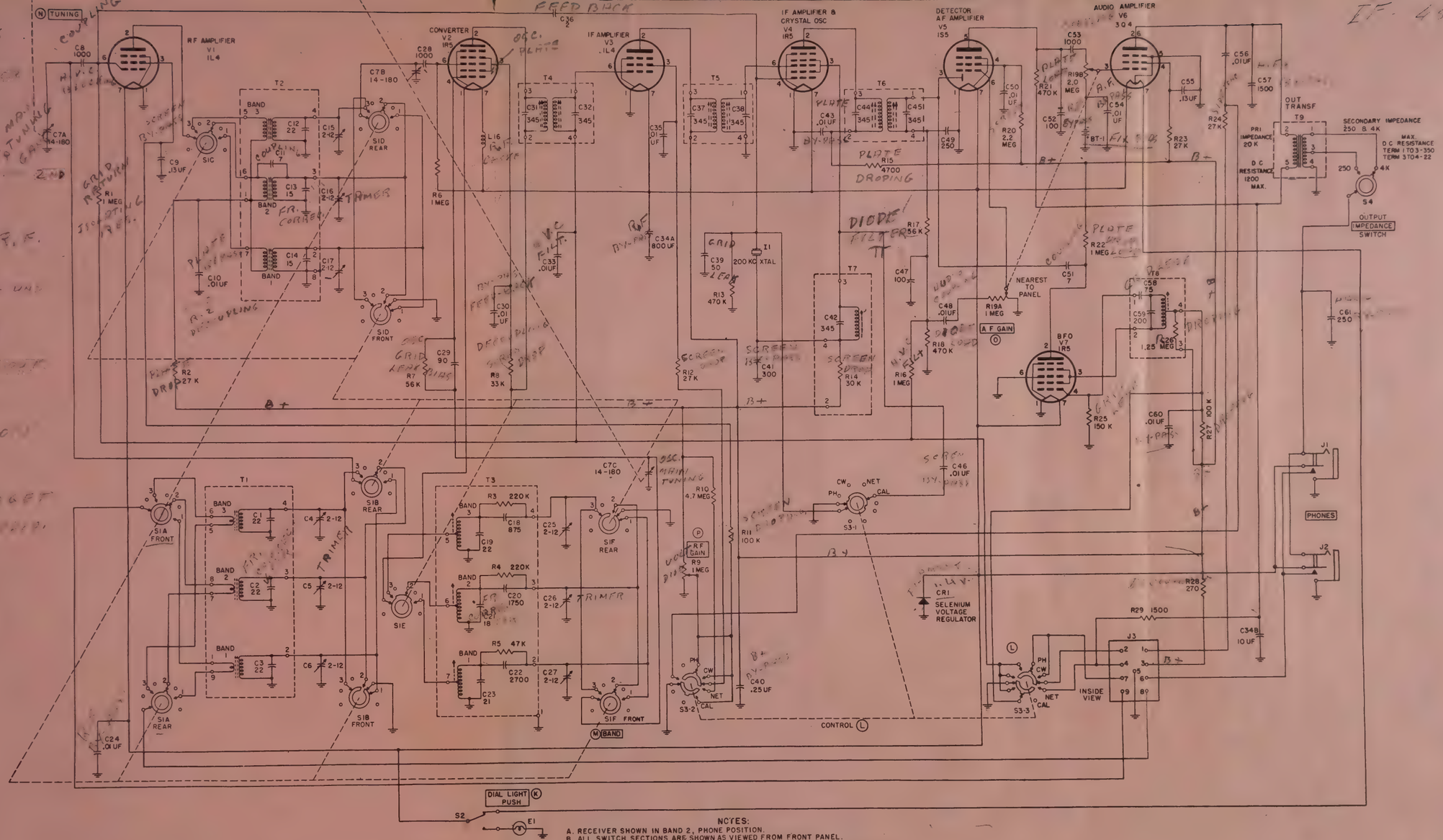
VOLTAGE CHART		
TERMINAL	VOLTAGE	CIRCUIT
20	6.3	TRANSMITTER FILAMENTS
21	425	REC. AND TRANS. - 105 V. -
22	—	———
23	6.3	REC. FILAMENT - 1.4 V.
24	NEG.	GROUND
32	425	TRANSMITTER B+
33	—	———
34	6.3	KEYING RELAY
35	—	———

VOLTAGE CHART MEASUREMENTS MADE WITH NO LOAD.

RECEPTACLE 240
VIEWED FROM OUTSIDE

NOTE:
UNLESS OTHERWISE SHOWN, RESISTORS ARE IN OHMS, CAPACITORS ARE IN UUF.

Generator GN–58, schematic diagram.

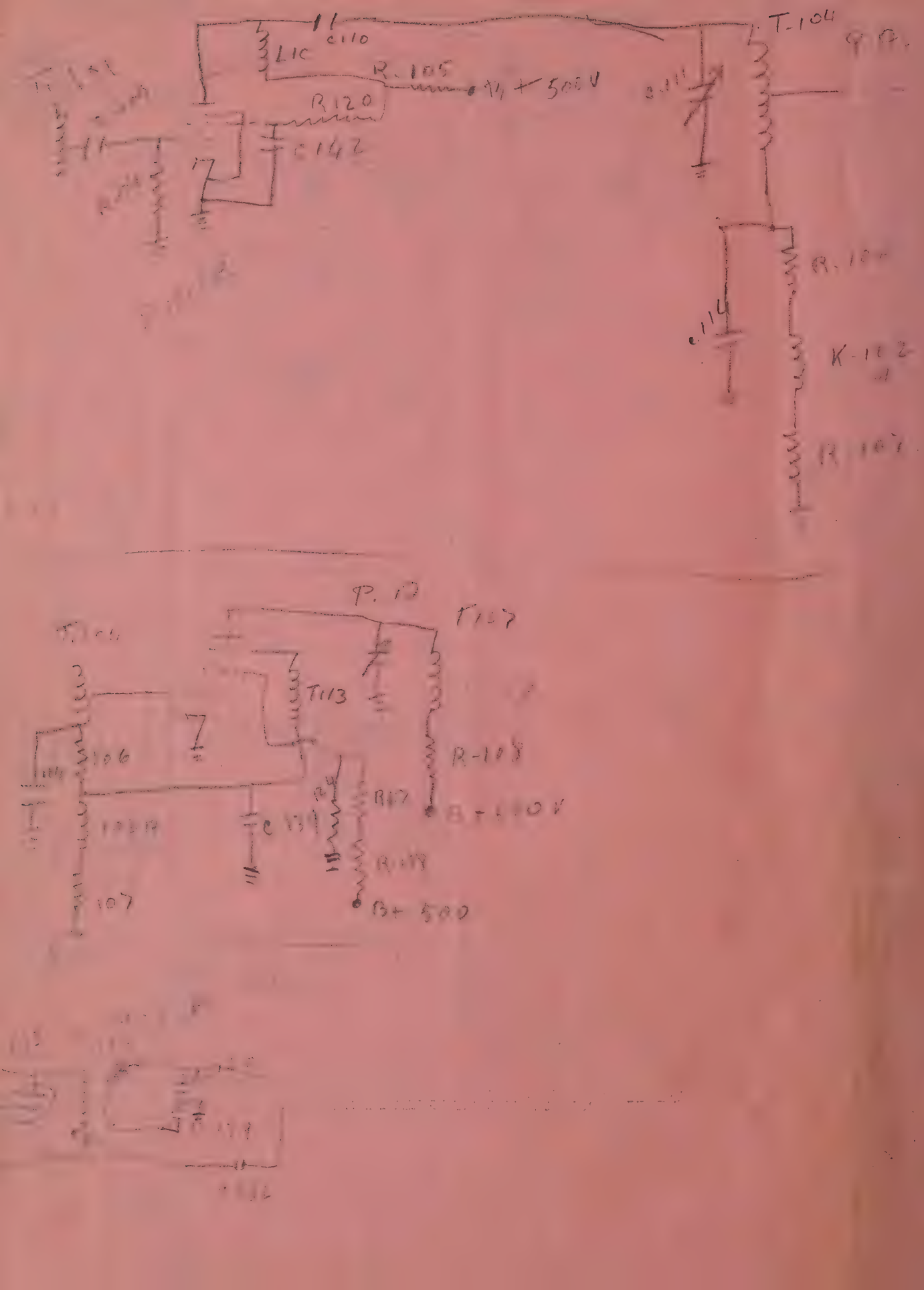


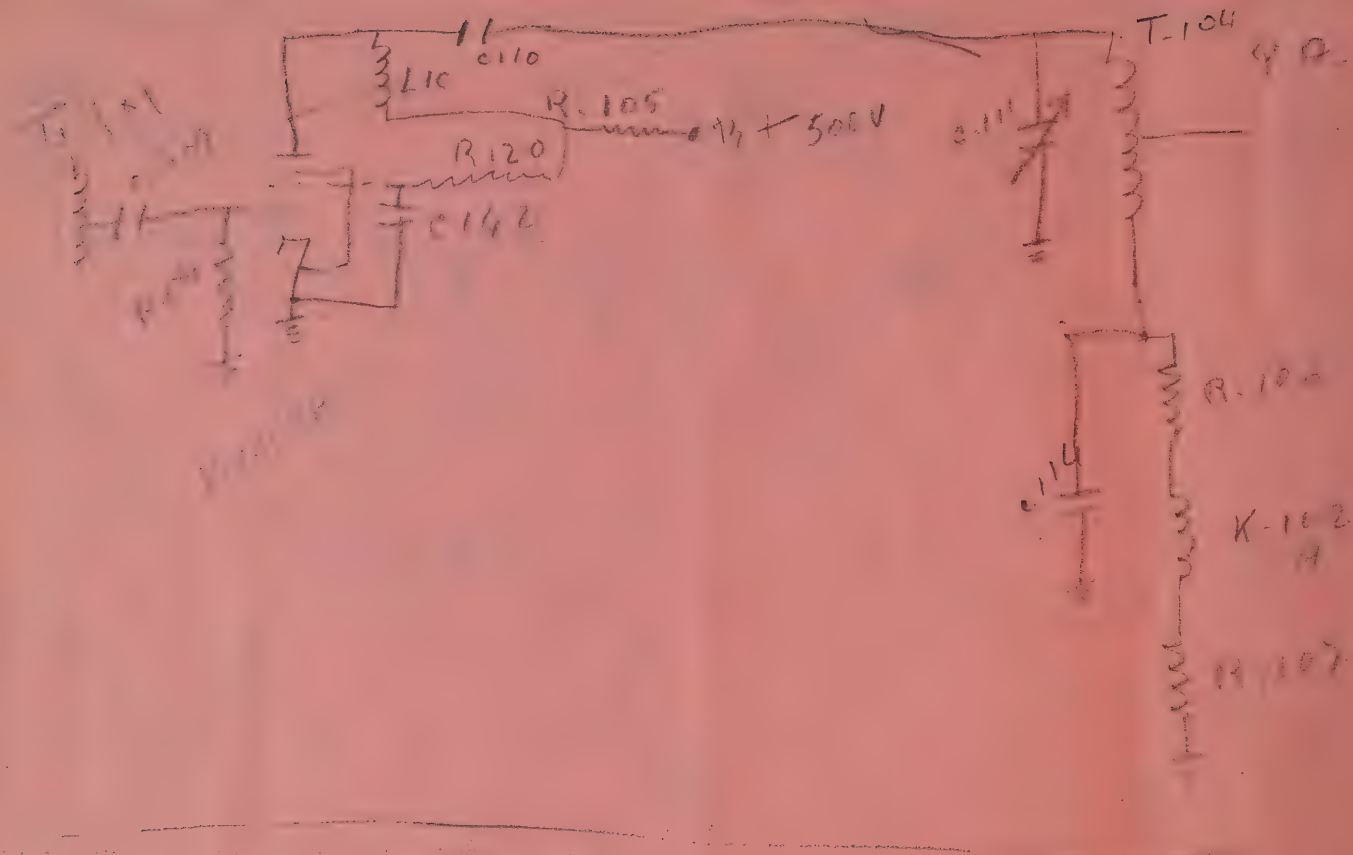
NOTES:

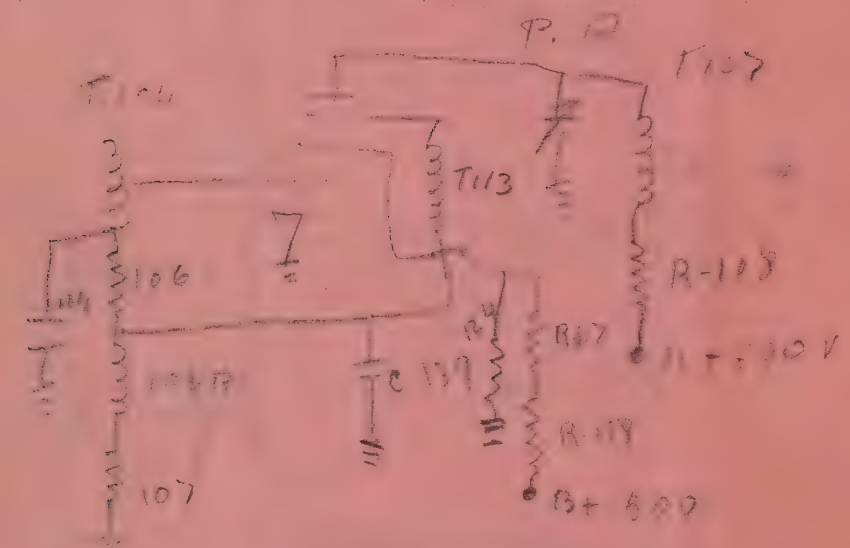
A. RECEIVER SHOWN IN BAND 2, PHONE POSITION.
B. ALL SWITCH SECTIONS ARE SHOWN AS VIEWED FROM FRONT PANEL.
C. FRONT SECTION OF EACH WAFER SECTION IS THE ONE NEAREST CONTROL KNOB.
D. UNLESS OTHERWISE SHOWN, RESISTORS ARE IN OHMS, CAPACITORS ARE IN UUF.
E. UNMARKED VALUES BESIDE COILS ARE D-C RESISTANCE IN OHMS.
F. J3 TERMINALS:

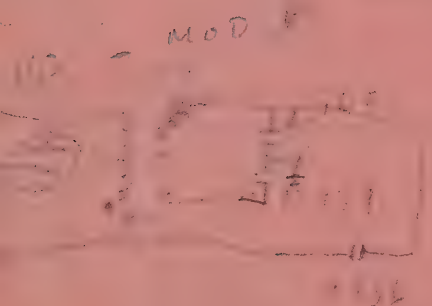
1. SIDETONE
2. NET +105V
3. RECEIVER +105V
4. +105V
5. GROUND
6. RECEIVER 1.4 V.
7. AUDIO TUBE POWER CONTROL
8. RECEIVER ANNTENNA
9. RECEIVER ANNTENNA

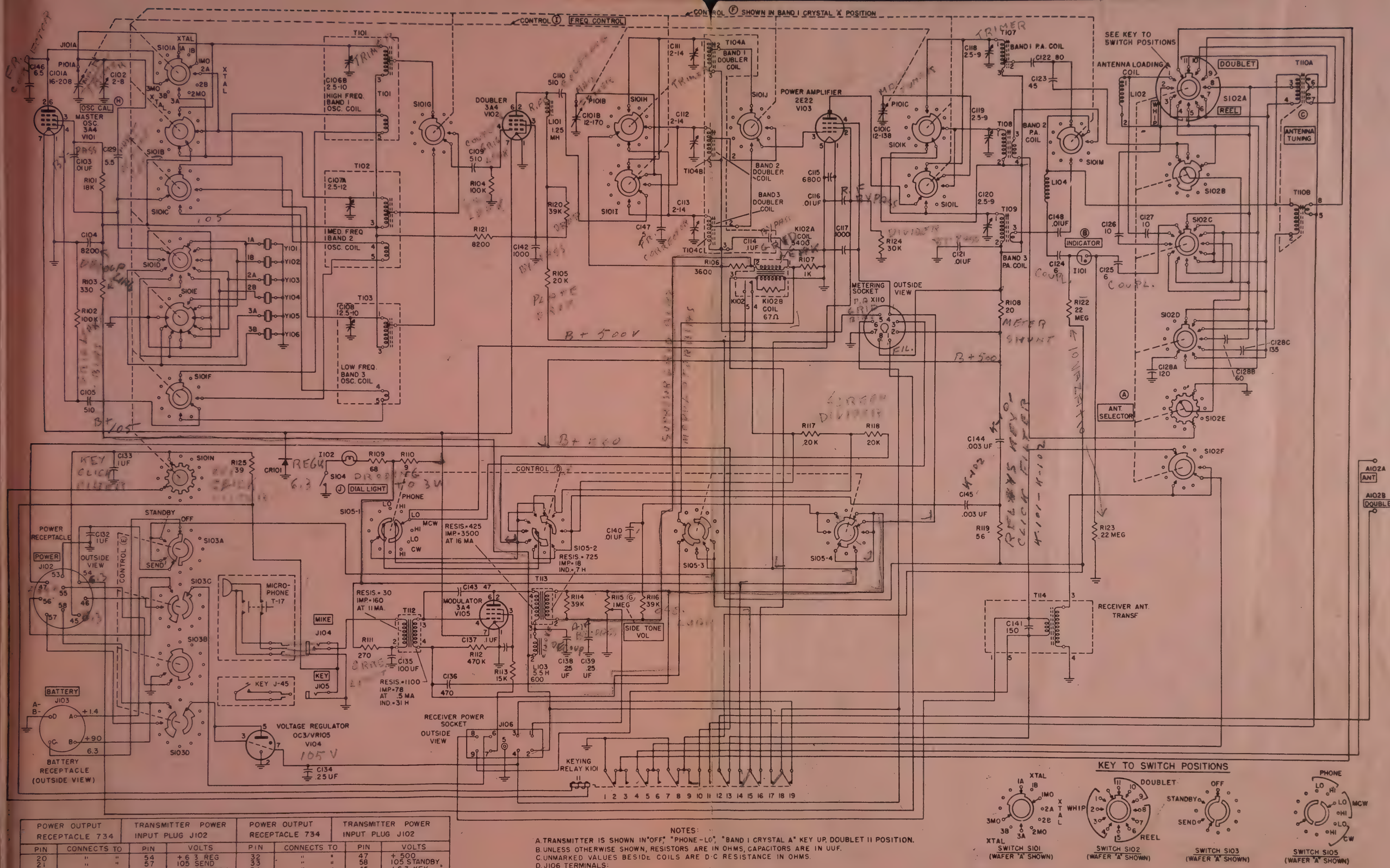
Radio section of receiver-transmitter RT-77/GRC-9, schematic diagram.


T-104
C110
L1C
R-105
+ 500 V
R120
C142
C114
R-106
K-102
R-107
P. 10
T107
T113
R-108
106
107
C131
R117
B+ 500


T-104
L10
C110
R-105
+ 300 V
R120
C112
C111
R-106
.114
K-102
M
M-107


P. 10
T-107
T113
R-108
106
R107
+ 210 V
C 137
R-119
107
B+ 300


MOD



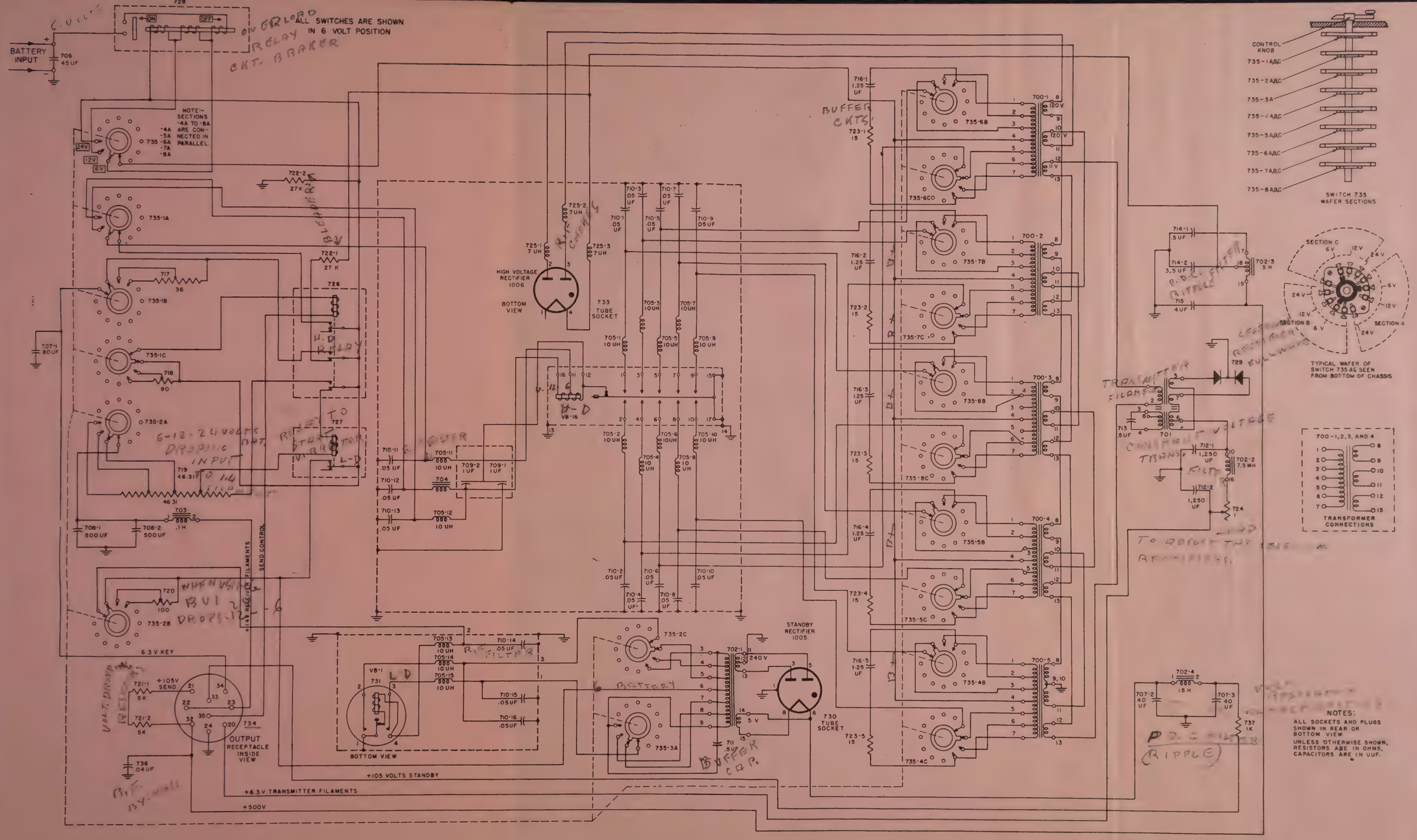
POWER OUTPUT RECEPTACLE 734		TRANSMITTER POWER INPUT PLUG J102		POWER OUTPUT RECEPTACLE 734		TRANSMITTER POWER INPUT PLUG J102	
PIN	CONNECTS TO	PIN	VOLTS	PIN	CONNECTS TO	PIN	VOLTS
20	" "	54	+6.3 REG	32	" "	47	+500
21	" "	57	105 SEND	33	" "	58	105 STANDBY
22	" "	56	1.4 STANDBY	34	" "	45	+6.3 KEY
23	" "	46	1.4 SEND	35	" "	55	SEND CONTROL
24	" "	53	A- B-				

NOTES:
A. TRANSMITTER IS SHOWN IN "OFF", "PHONE - LO", "BAND I CRYSTAL A" KEY UP, DOUBLET II POSITION.
B. UNLESS OTHERWISE SHOWN, RESISTORS ARE IN OHMS, CAPACITORS ARE IN UUF.
C. UNMARKED VALUES BESIDE COILS ARE D-C RESISTANCE IN OHMS.
D. J106 TERMINALS:
1. SIDE-TONE SIGNAL
2. NET 105V
3. RECEIVER 105V
4. 105V
5. GROUND
6. RECEIVER 1.4V
7. AUDIO TUBE POWER CONTROL
8. RECEIVER ANTENNA
9. RECEIVER ANTENNA

KEY TO SWITCH POSITIONS

SWITCH SI01 (WAFER "A" SHOWN) | SWITCH SI02 (WAFER "A" SHOWN) | SWITCH SI03 (WAFER "A" SHOWN) | SWITCH SI05 (WAFER "A" SHOWN)

3. *Transmitter section of receiver-transmitter* ***RT-77/GRC-9****, schematic diagram.*



4. *Vibrator power unit PE–237 (early models), schematic diagram.*

SCHEMATIC
AND
BLOCK DIAGRAMS
OF
RADIO RELAY
EQUIPMENT

THE SOUTHEASTERN SIGNAL SCHOOL

Camp Gordon, Georgia

11-E-12/16-D

Army Ft McPherson Ga 1385/54

AUGUST 1954

THE SOUTHEASTERN SIGNAL SCHOOL
Camp Gordon, Georgia

SCHEMATIC AND BLOCK DIAGRAMS

RADIO RELAY EQUIPMENT

NUMBER	TITLE
1	Radio Transmitter T-14H/TRC-1, Schematic Diagram
2	Radio Transmitter T-14D,-14E/TRC-1, Schematic Diagram
3	R-19/TRC-1 Receiver Block Diagram
4	Radio Receiver R-19H/TRC-1, Schematic Diagram
5	Radio Receiver R-19D,-19E/TRC-1, Schematic Diagram

METER SWITCH

POSIT

1 — T-1 ; 2 MA. FOR L MX.

2 T-2 " "

3 T-3

T-4 —

T-5 —

1-3-2-4 — 1,65 " AND DIP FOR MINIMUM

(PARSET)

FOR CURRENT

PARSET FOR FR. SO YOU DONT GET HARM

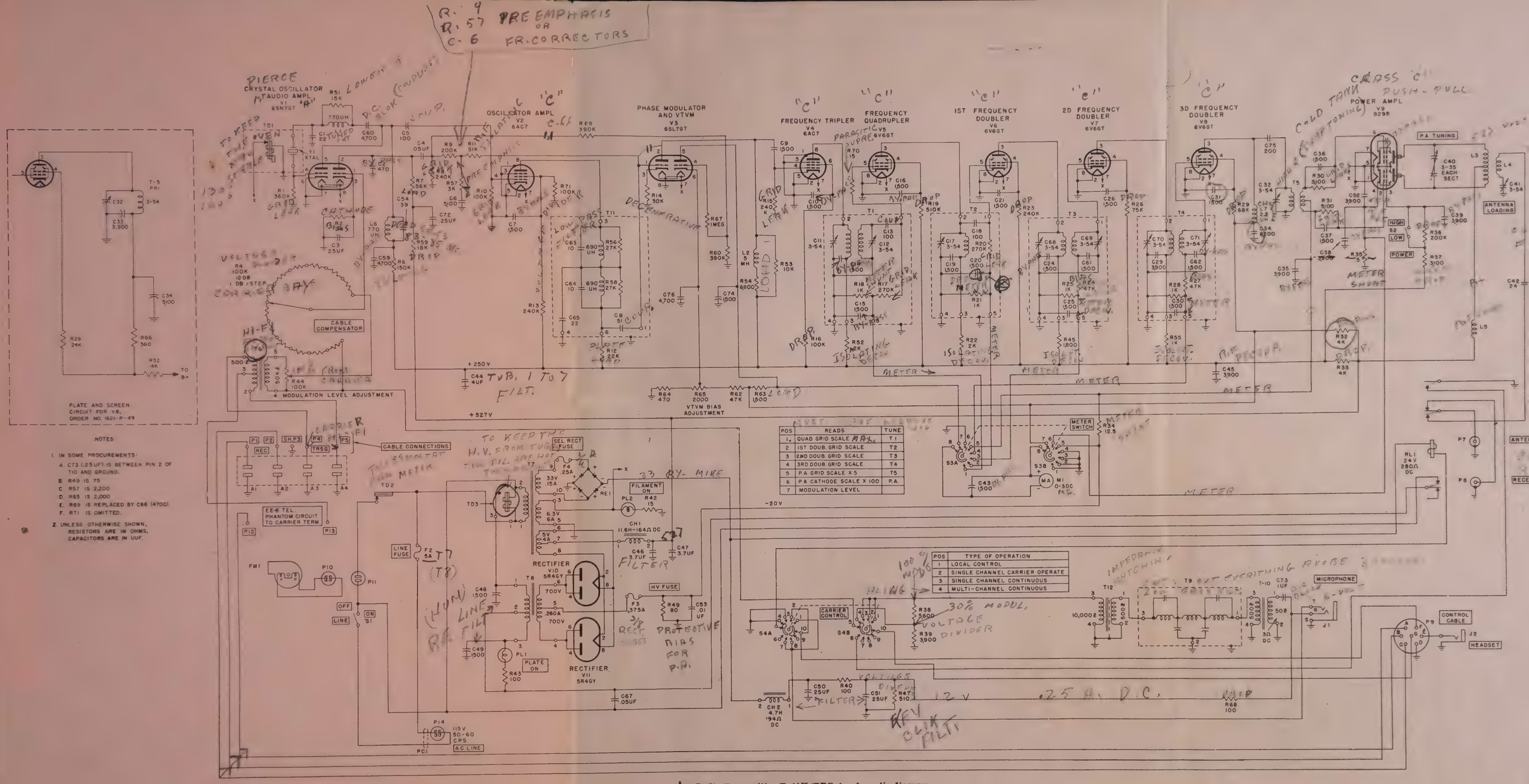
CITADEL

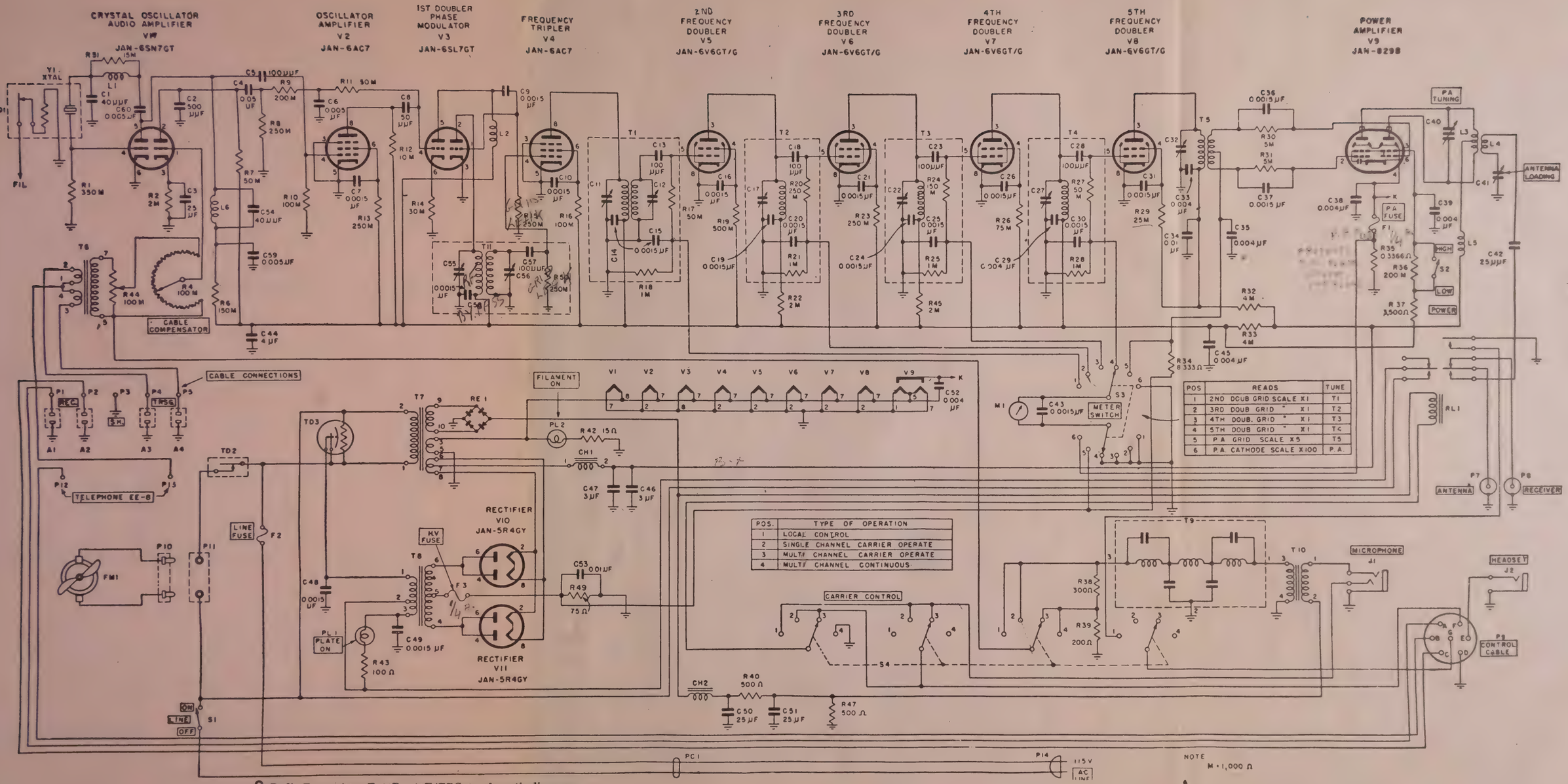
SCREW SLOTS TURN
OUTER - CLOCKWISE FOR MIN.
CLOCKWISE - TO MAX.

1 — T-1 .12 MIN. FOR MIN.
2 T-2 .9 MIN. " "
3 T-3 .5 MIN. " "
T-4 1.3 MIN " "
T-5 1.5 MIN " "

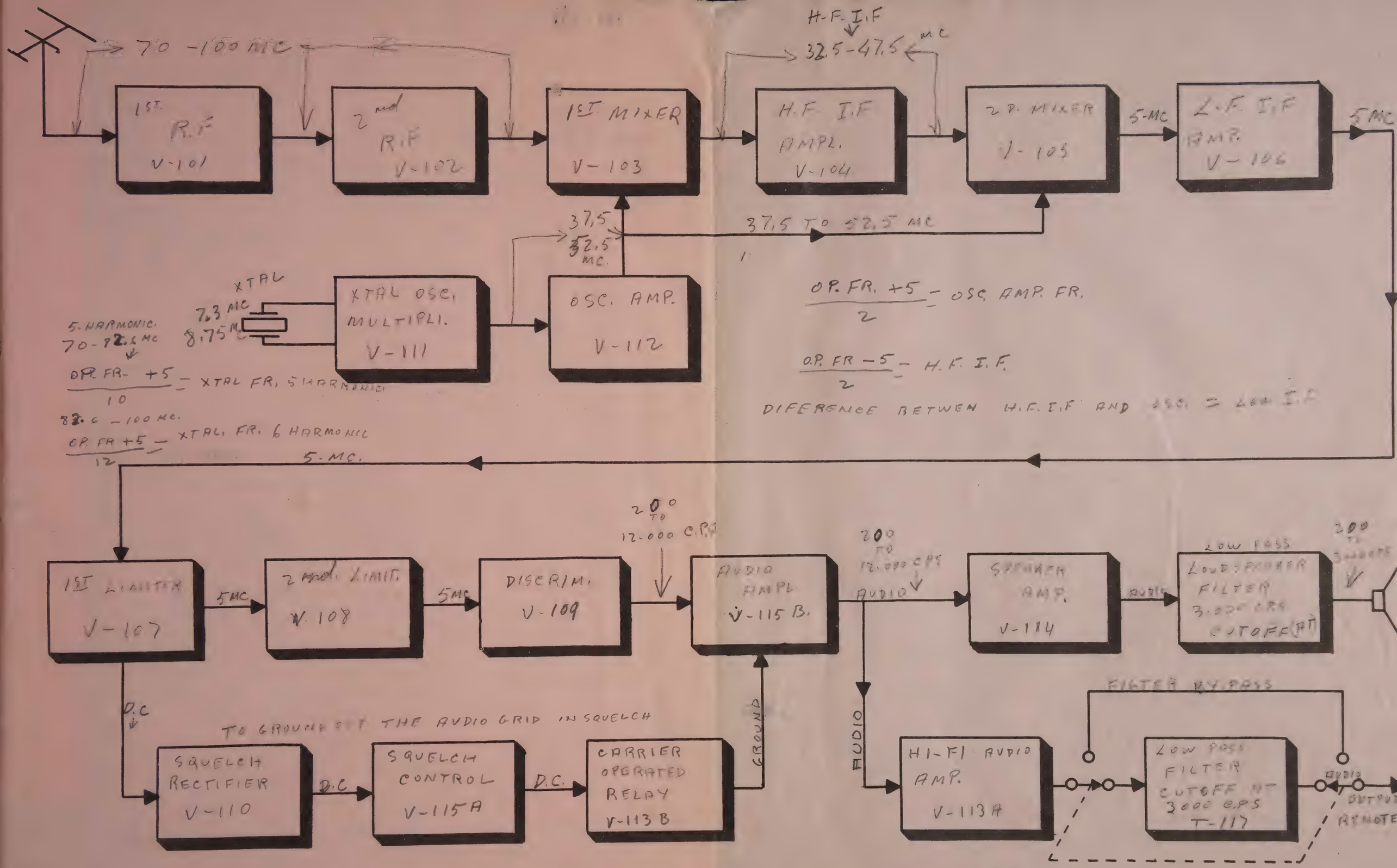
1-3-2-4 — 1.65 " AND DIP FOR MINIMUM

1.65 MIN.


PIERCE
CRYSTAL OSCILLATOR
1ST AUDIO AMPL
V1
6SN7GT
"A"
OSCILLATOR AMPL
V2
6AC7
"C"
PHASE MODULATOR
AND VTVM
V3
6SL7GT
"C"
FREQUENCY TRIPLER
V4
6AC7
"C"
FREQUENCY
QUADRUPLER
V5
6V6GT
"C"
1ST FREQUENCY
DOUBLER
V6
6V6GT
"C"
2D FREQUENCY
DOUBLER
V7
6V6GT
"C"
3D FREQUENCY
DOUBLER
V8
6V6GT
CLASS "C"
PUSH-PULL
POWER AMPL
V9
8298
PLATE AND SCREEN
CIRCUIT FOR V8,
ORDER NO. 1621-P-49
NOTES:
1. IN SOME PROCUREMENTS:
A. C73 (.25 UF) IS BETWEEN PIN 2 OF T10 AND GROUND.
B. R49 IS 75
C. R57 IS 2,200
D. R65 IS 2,000
E. R69 IS REPLACED BY C66 (4700).
F. R71 IS OMITTED.
2. UNLESS OTHERWISE SHOWN, RESISTORS ARE IN OHMS, CAPACITORS ARE IN UUF.
MODULATION LEVEL ADJUSTMENT
VTVM BIAS ADJUSTMENT
CABLE COMPENSATOR
CABLE CONNECTIONS
EE-8 TEL PHANTOM CIRCUIT TO CARRIER TERM
RECTIFIER V10 5R4GY
RECTIFIER V11 5R4GY
FILAMENT ON
PLATE ON
HV FUSE
LINE FUSE
OFF
LINE
ON
31
115V 50-60 CPS A.C. LINE
+250V
+527V
-20V
ANTENNA
RECEIVER
CONTROL CABLE
HEADSET
MICROPHONE
P.A. TUNING
ANTENNA LOADING
METER SHUNT
CARRIER CONTROL
METER SWITCH
MI 0-30DC MA.
RLI 24V 280Ω DC
CH1 11.6H-164Ω DC
CH2 4.7H 194Ω DC
23 KV-MIKE
30% MODUL. VOLTAGE DIVIDER
PROTECTIVE BIAS FOR P.A.
FILTER
METER
TO 8+
TO ANT. RELAY
TO MOD. CONT. RELAY
TO KEY JACK
TO MIKE JACK
TO PHONE JACK
TO HEADSET JACK
TO CONTROL CABLE
TO RECEIVER
TO ANTENNA
TO P.A. GRID
TO P.A. PLATE
TO P.A. TUNING
TO P.A. LOADING
TO P.A. METER
TO P.A. METER SHUNT
TO P.A. POWER
TO P.A. HIGH
TO P.A. LOW
TO P.A. GRID METER
TO P.A. PLATE METER
TO P.A. GRID METER
TO P.A. PLATE METER
TO P.A. METER SHUNT
TO P.A. POWER
TO P.A. HIGH
TO P.A. LOW


CRYSTAL OSCILLATOR AUDIO AMPLIFIER VW JAN-6SN7GT
OSCILLATOR AMPLIFIER V2 JAN-6AC7
1ST DOUBLER PHASE MODULATOR V3 JAN-6SL7GT
FREQUENCY TRIPLER V4 JAN-6AC7
2ND FREQUENCY DOUBLER V5 JAN-6V6GT/G
3RD FREQUENCY DOUBLER V6 JAN-6V6GT/G
4TH FREQUENCY DOUBLER V7 JAN-6V6GT/G
5TH FREQUENCY DOUBLER V8 JAN-6V6GT/G
POWER AMPLIFIER V9 JAN-8298
CABLE COMPENSATOR
CABLE CONNECTIONS
TELEPHONE EE-8
RECTIFIER V10 JAN-5R4GY
RECTIFIER V11 JAN-5R4GY
FILAMENT ON
PLATE ON
HV FUSE
LINE FUSE
CARRIER CONTROL
METER SWITCH
PA TUNING
ANTENNA LOADING
PA FUSE
MICROPHONE
HEADSET
CONTROL CABLE
ANTENNA
RECEIVER
ON LINE OFF
115 V AC 1 INF
POS. | TYPE OF OPERATION
1 | LOCAL CONTROL
2 | SINGLE CHANNEL CARRIER OPERATE
3 | MULTI CHANNEL CARRIER OPERATE
4 | MULTI CHANNEL CONTINUOUS
POS | READS | TUNE
1 | 2ND DOUB GRID SCALE X1 | T1
2 | 3RD DOUB GRID " X1 | T2
3 | 4TH DOUB. GRID " X1 | T3
4 | 5TH DOUB GRID " X1 | T4
5 | P.A GRID SCALE X5 | T5
6 | P.A CATHODE SCALE X100 | P.A
NOTE M = 1,000 Ω

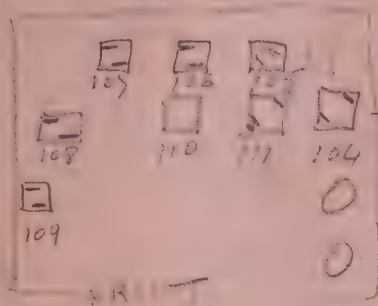
2. *Radio Transmitter T–14D, –14E/TRC–1, schematic diagram.*



3. R-19/TRC-1 Receiver block diagram

R-19.

FROM 70 TO 100 - ADJUST TO XTAL FIL.
1000 C.P.S. TONE FOR MODU.

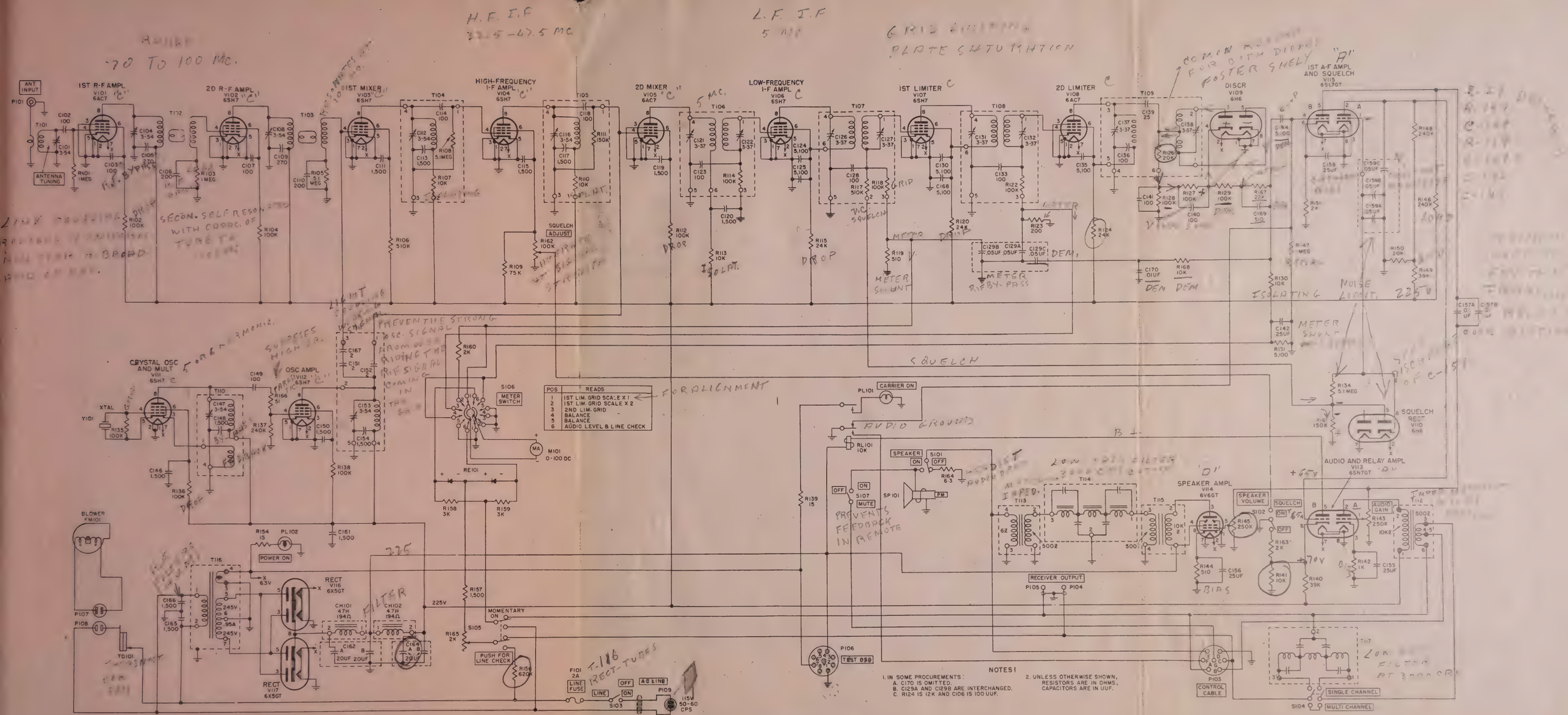


PRESET -
T-110 - OSC.
T-111 - OSC
T-105 - HI-IF
T-104 - 1ST MIXER
T-103 - 2nd R.F
T-102 - 1ST R.F
T-101 - ANT.

LINE ON
MUTE SWITCH OFF
SQUELCH OFF
METER SWICTH POSI-1
MULTICHANNEL (1)

DO NOT TO
T-102 - 103 -

TURN ON TEST OSCIL. IF IS PRESET NOISE SHOULD CUT OUT
POSIT-1- MAXIM. AND POSIT-2 - GO TO 80 U.A.
POST- 3 - SECOND LIMETER DONT ADJUST. 40-60 U.A
4 & 5
TUNER - SECONDARY - T-109 TO MAXIMUM READING OF 10 - TUNE THE
PRIM. TO MAXI. (PRIM DISC)
BACK TO SECOND. AND TUNE TO ZERO IN BOTH POSIT 4 & 5
HINTS
MAXIMUM. FROM T-110 TO T-101 - GO BACK TO POSIT-1
IF STOPS ARE GONE TURN OSC. OFF (NO NOISE) IF NOISE
IF NOT GO TO R.F STAGES
I.F. PRESET



POS	READS
1	1ST LIM. GRID SCALE X 1
2	1ST LIM. GRID SCALE X 2
3	2ND LIM. GRID
4	BALANCE
5	BALANCE
6	AUDIO LEVEL & LINE CHECK

NOTES:

1. IN SOME PROCUREMENTS:
   A. C170 IS OMITTED.
   B. C129A AND C129B ARE INTERCHANGED.
   C. R124 IS 12K AND C106 IS 100 UUF.
2. UNLESS OTHERWISE SHOWN, RESISTORS ARE IN OHMS, CAPACITORS ARE IN UUF.

4. ***Radio Receiver R-19H/TRC-1, schematic diagram.***

OSC. FR. = CARRIER FR. ± 5 KC
2

MULTIPL. TUNED TO 6 XTAL HARM.

FR. FROM 70 - 82.6 - 5 HARM.
" " 82.6 - 100 - 6 "

HI-IF FR. 70 - 82.6 - 7.5 - 8.75
" " 82.6 - 100 - 7.3 - 8.541

FORMULA FOR 70 - 82.6

CARRIER FR. ± 5
10

HI-IF = OPR. FR. - 5
2

SQUELCH

WHEN STATION & SIGNAL RECEIVED HIGH NOISE VOLT FR. IN GRID OF V-115 A. TUBE OUTPUT PUTS MORE ± POSIT. IN GRID OF V-113. TUBE CONDUCTS. RY-101 ENERGIZES. WHEN NOISE V-115 CONDUCT. LESS POSIT. ACTS ON V-113. TUBE CUTS OFF. RY-101 DE-ENERGIZES

R-19. RECEIVER TEST PROC.

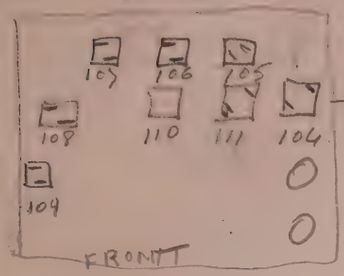
96 MEG.

IF'S ARE [illegible]

XTAL CONTROL OSC.

TUNING FROM 70 TO 100 - ADJUST TO XTAL FR.

1000 C.P.S. TONE FOR MODU.

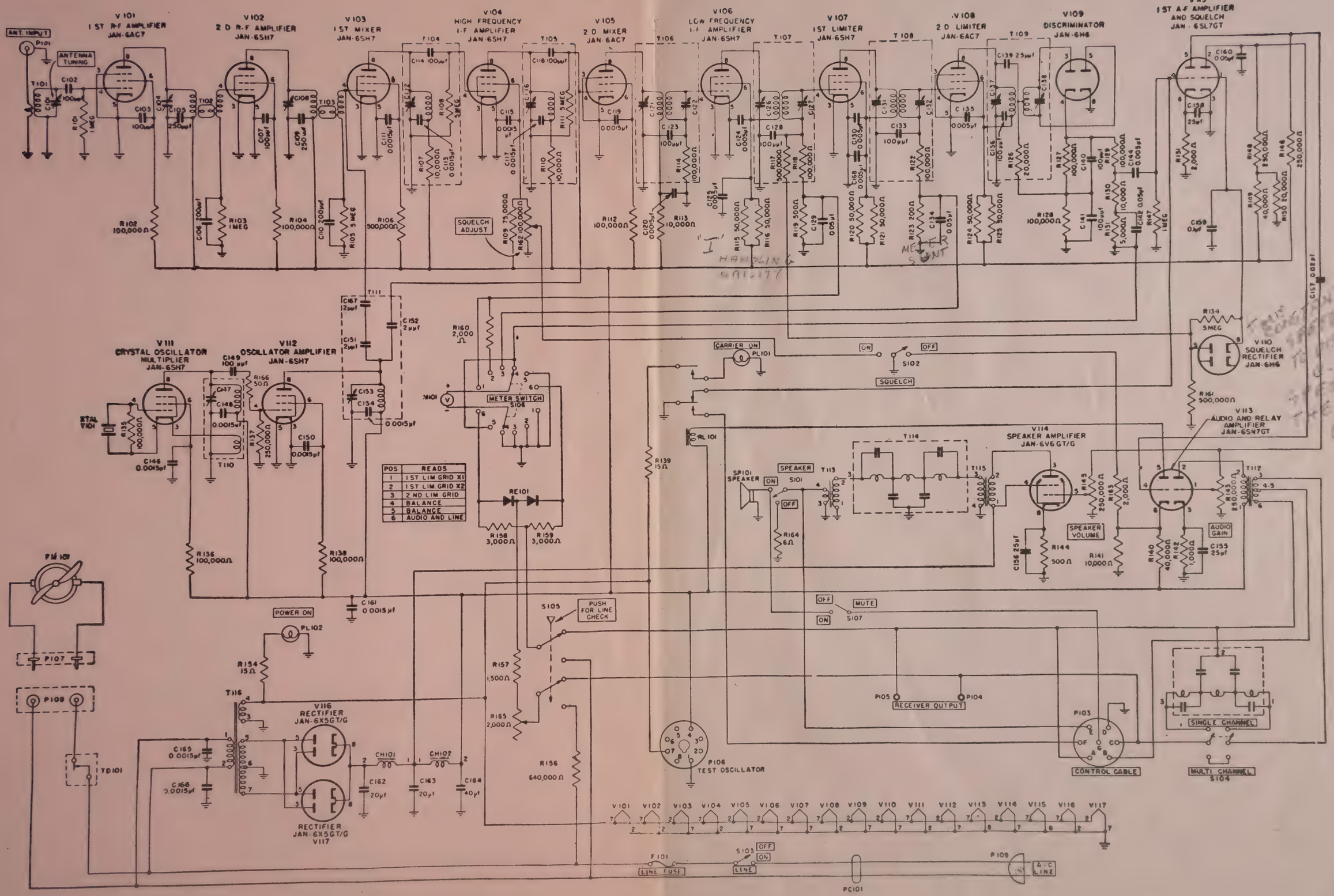


PRESET -
T-100 - OSC.
T-111 - OSC AMP
T-105 - HI-IF
T-104 - 1ST MIXER
T-103 - 2nd R.F
T-102 1ST R.F
T-101 - ANT.

LINE ON
MUTE SWITCH OFF
SQUELCH OFF
METER SWICTH POSI-1
MULTICHANNEL 1
SPEAKER ON - MAXI VOLUME

DO NOT TOUCH
T-107 - 108 - 106

PRESET FOR MAXIMUM NOISE - (PRESET THE TEST OSCILLATOR)
TURN ON TEST OSCIL. IF IS PRESET NOISE SHOULD CUT OUT
" " 1000 C.P.S. MODUL. TONE
POSIT-1 - MAXIM. AND POSIT-2 - GO TO 2 U.P.
POST-3 - SECOND LIMITER DONT ADJUST - 4 - [illegible]
" 4 & 5 BALANCE DISCRIMINAT. (POSIT. READING)
TEST OSC. CARRIER ON MODUL. OFF
TUNER SECONDARY - T-109 TO A READING OF 10 - TUNED THE PRIM. TO MAXI. (PRIM. DISC) (SECON BALANCE) THEN GO BACK TO SECOND. AND TUNE TO ZERO IN BOTH POSIT. 4 & 5
(HINTS) IF NO READING, PUT - POSIT. 3. ADJUST FOR MAXIMUM. FROM T-110 TO T-101 - GO BACK TO POSIT. 1
IF STOPS ARE GONE TURN OSC. OFF (NO NOISE) IF NOISE PRESENT WE ARE OFF FR. PRESET AGAIN.
IF OFF FR. GO TO R.F. STAGES TUNE FOR AUD.
I.F. PRESE PARALELL TO BACK



5. *Radio Receiver R-19D, -19E/TRC-1, schematic diagram.*

SCHEMATIC DIAGRAMS OF RADIO EQUIPMENT IN ARMY AIRCRAFT

THE SOUTHEASTERN SIGNAL SCHOOL
Camp Gordon, Georgia

11-E-12/19-D
Army Ft McPherson Ga 1384/54

AUGUST 1954

THE SOUTHEASTERN SIGNAL SCHOOL
Camp Gordon, Georgia

SCHEMATIC DIAGRAMS

RADIO EQUIPMENT IN ARMY AIRCRAFT

NUMBER	TITLE
1	Radio Transmitter ARC Type T-11A(14V) and Type T-11A(28V), Schematic Diagram
2	Radio Transmitter ARC Type T-13(14V) and Type T-13(28V), Schematic Diagram
3	Radio Receiver ARC Type R-15(14V) and Type R-15(28V), Schematic Diagram
4	Radio Receiver ARC Type R-19(14V) and Type R-19(28V), Schematic Diagram
5	Radio Receiver ARC Type R-10A(14V) and Type R-10A(28V), Schematic Diagram
6	Radio Receiver ARC Type R-11A(14V) and Type R-11A(28V), Schematic Diagram
7	VHF Navigational Receiving Equipment ARC Type 15C, Schematic Diagram
8	Radio Set ARC Type 12, Model L-19A Aircraft Installation, External Wiring Schematic Diagram

THE SOUTHEASTERN SIGNAL SCHOOL
Camp Gordon, Georgia

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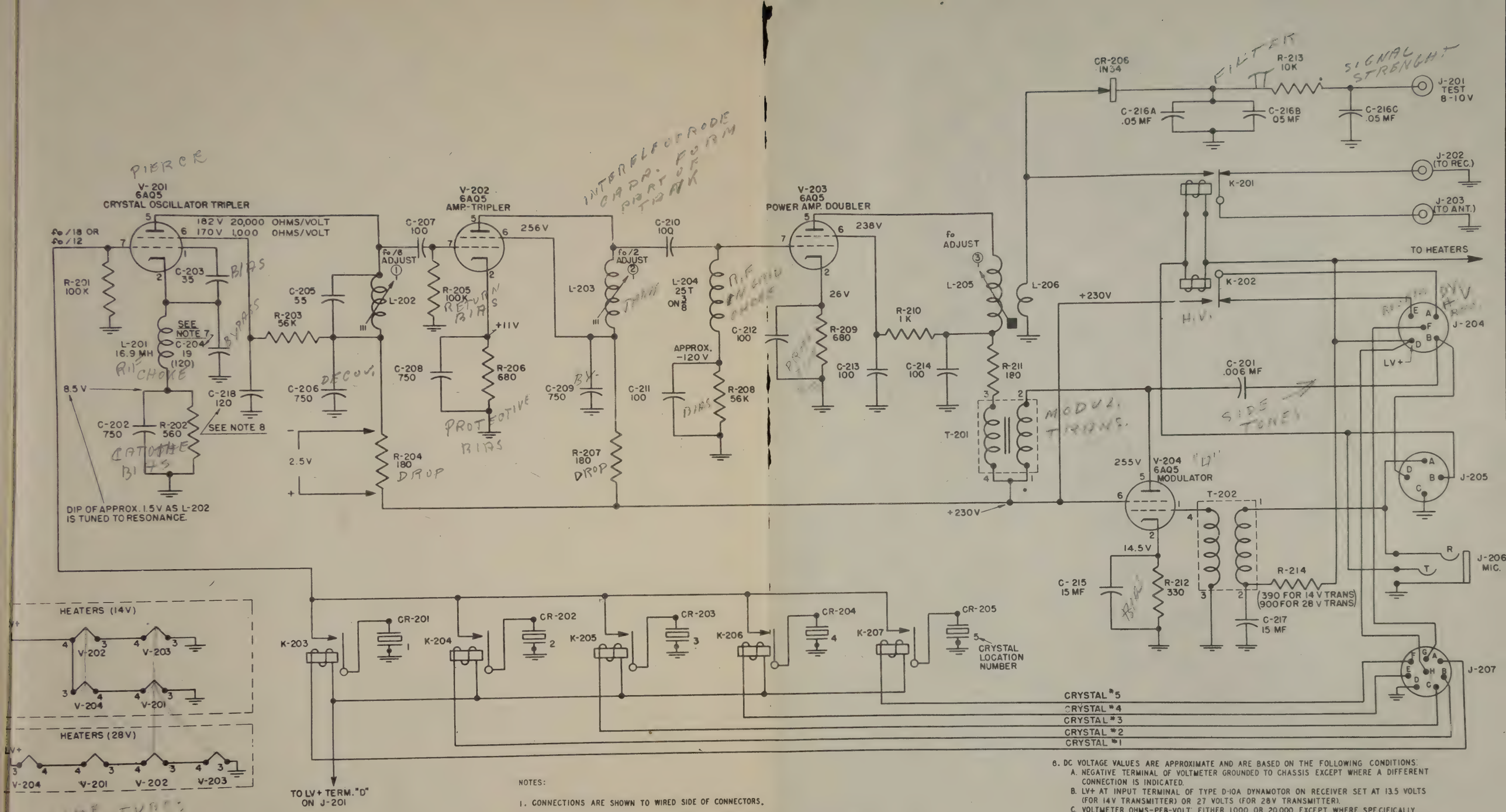
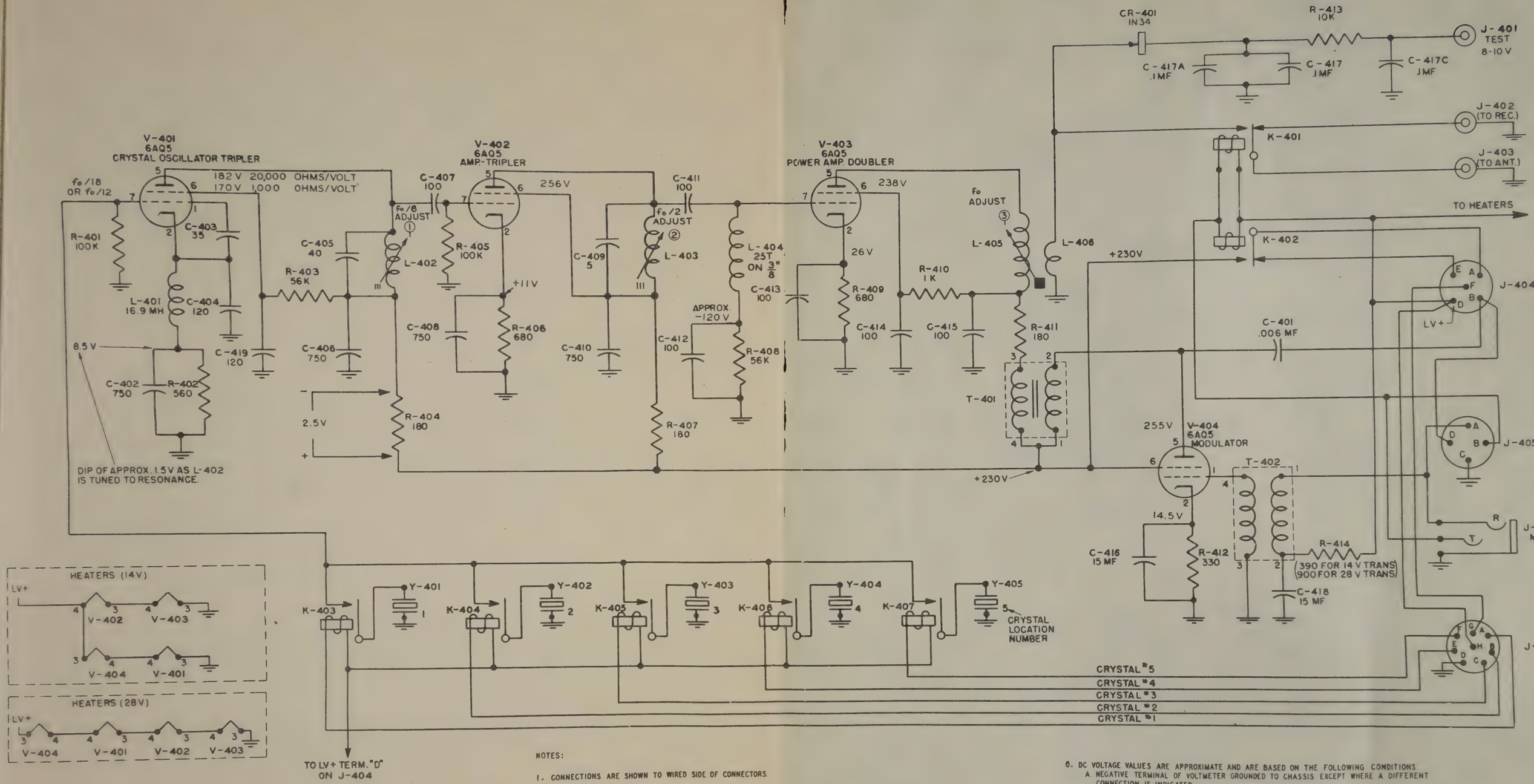
4	Radio Receiver ARC Type R-19(14V) and Type R-19(28V), Schematic Diagram
5	Radio Receiver ARC Type R-10A(14V) and Type R-10A(28V), Schematic Diagram
6	Radio Receiver ARC Type R-11A(14V) and Type R-11A(28V), Schematic Diagram
7	VHF Navigational Receiving Equipment ARC Type 15C, Schematic Diagram
8	Radio Set ARC Type 12, Model L-19A Aircraft Installation, External Wiring Schematic Diagram



NOTES:

1. CONNECTIONS ARE SHOWN TO WIRED SIDE OF CONNECTORS.
2. CAPACITOR VALUES ARE IN MICROMICROFARADS UNLESS FOLLOWED BY "MF" - MICROFARADS.
3. RESISTOR VALUES ARE IN OHMS UNLESS FOLLOWED BY "K" - KILOHM (1,000 OHMS) OR "MEG" - MEGOHM (1,000.000 OHMS).
4. INDUCTOR VALUES ARE IN MICROHENRIES UNLESS FOLLOWED BY "MH" MILLIHENRY (1,000 MICROHENRIES) OR "H" - HENRY.
5. ALL RELAYS ARE SHOWN UNENERGIZED. FOR KEYED RELAYS K-201 AND K-202 THIS IS THE STANDBY POSITION.
6. DC VOLTAGE VALUES ARE APPROXIMATE AND ARE BASED ON THE FOLLOWING CONDITIONS:
   A. NEGATIVE TERMINAL OF VOLTMETER GROUNDED TO CHASSIS EXCEPT WHERE A DIFFERENT CONNECTION IS INDICATED.
   B. LV+ AT INPUT TERMINAL OF TYPE D-10A DYNAMOTOR ON RECEIVER SET AT 13.5 VOLTS (FOR 14V TRANSMITTER) OR 27 VOLTS (FOR 28V TRANSMITTER).
   C. VOLTMETER OHMS-PER-VOLT: EITHER 1,000 OR 20,000 EXCEPT WHERE SPECIFICALLY INDICATED.
7. VALUE IN PARENTHESES USED IN 14-VOLT EQUIPMENT BEGINNING WITH SERIAL NO. 1001, AND IN 28-VOLT EQUIPMENT BEGINNING WITH SERIAL NO. 701.
8. THIS PART ADDED IN 14-VOLT EQUIPMENT BEGINNING WITH SERIAL NO. 1001, AND IN 28-VOLT EQUIPMENT BEGINNING WITH SERIAL NO. 701.
9. fo=OUTPUT FREQUENCY.

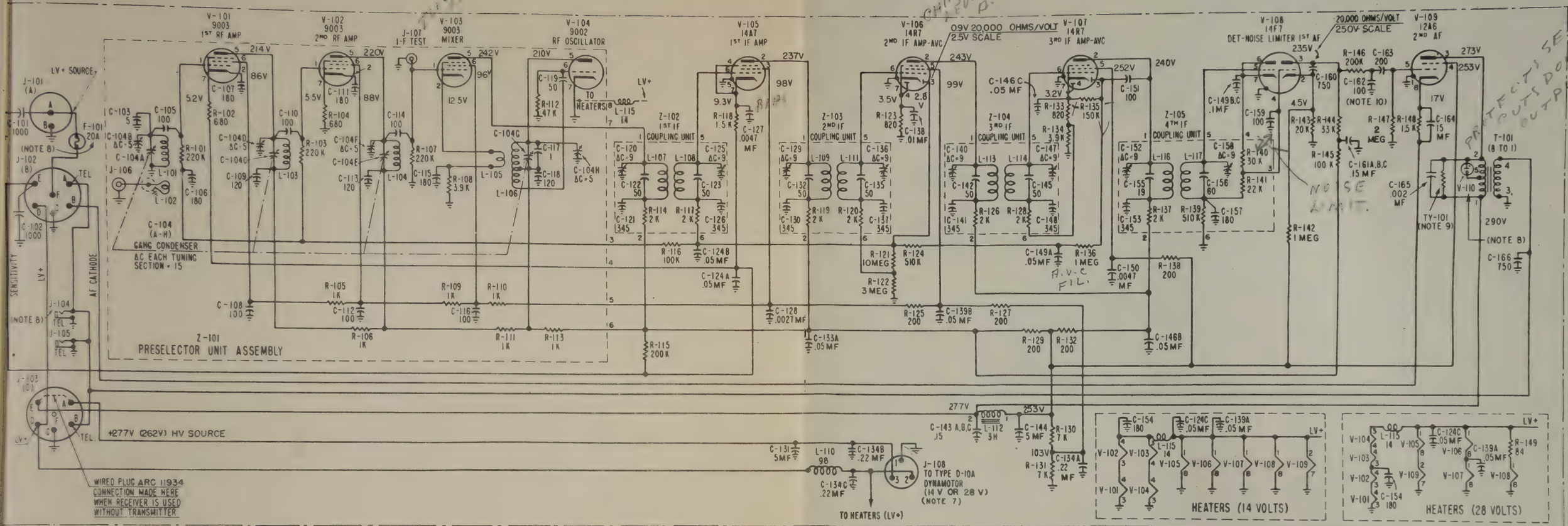
1. Radio Transmitter ARC Type T-11A(14v) and Type T-11A(28v), Schematic Diagram



NOTES:

1. CONNECTIONS ARE SHOWN TO WIRED SIDE OF CONNECTORS.
2. CAPACITOR VALUES ARE IN MICROMICROFARADS UNLESS FOLLOWED BY "MF" - MICROFARADS.
3. RESISTOR VALUES ARE IN OHMS UNLESS FOLLOWED BY "K" - KILOHM (1,000 OHMS) OR "MEG" - MEGOHM (1,000,000 OHMS).
4. INDUCTOR VALUES ARE IN MICROHENRIES UNLESS FOLLOWED BY "MH" MILLIHENRY (1,000 MICROHENRIES) OR "H" - HENRY.
5. ALL RELAYS ARE SHOWN UNENERGIZED. FOR KEYED RELAYS K-01 AND K-02 THIS IS THE STANDBY POSITION.
6. DC VOLTAGE VALUES ARE APPROXIMATE AND ARE BASED ON THE FOLLOWING CONDITIONS:
   A. NEGATIVE TERMINAL OF VOLTMETER GROUNDED TO CHASSIS EXCEPT WHERE A DIFFERENT CONNECTION IS INDICATED.
   B. LV+ AT INPUT TERMINAL OF TYPE D-10A DYNAMOTOR ON RECEIVER SET AT 13.5 VOLTS (FOR 14V TRANSMITTER) OR 27 VOLTS (FOR 28V TRANSMITTER).
   C. VOLTMETER OHMS-PER-VOLT: EITHER 1,000 OR 20,000 EXCEPT WHERE SPECIFICALLY INDICATED.
7. fo=OUTPUT FREQUENCY.

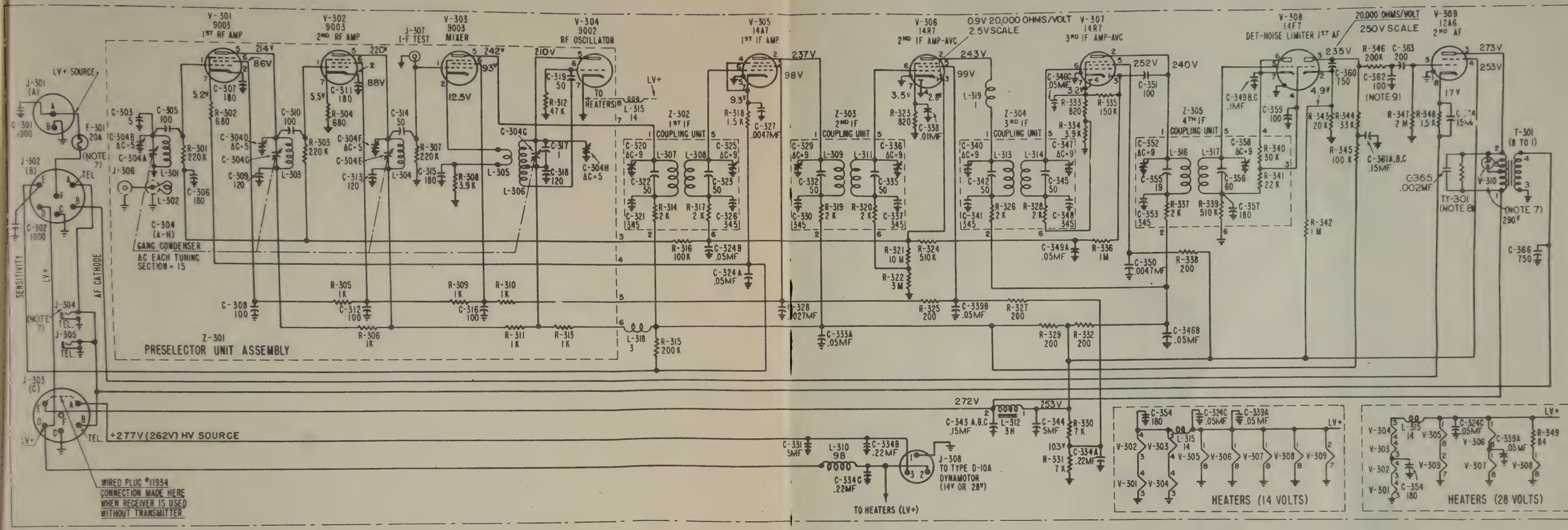
2. Radio Transmitter ARC Type T-13(14v) and Type T-13(28v), Schematic Diagram



NOTES:

1. CONNECTIONS ARE SHOWN TO WIRED SIDE OF CONNECTORS.
2. CAPACITOR VALUES ARE IN MICROMICROFARADS UNLESS FOLLOWED BY "MF" - MICROFARAD.
3. RESISTOR VALUES ARE IN OHMS UNLESS FOLLOWED BY "K" - KILOHM (1,000 OHMS) OR "MEG" - MEGOHM 1,000,000 OHMS
4. INDUCTOR VALUES ARE IN MICROHENRIES UNLESS FOLLOWED BY "MH" - MILLIHENRY (1,000 MICROHENRIES) OR "H" - HENRY.
5. THE IF IS 15 MC. THE RF OSCILLATOR FREQUENCY IS 15 MC LESS THAN THE RF SIGNAL FREQUENCY.
6. D-C VOLTAGES SHOWN ARE APPROXIMATE AND TAKEN UNDER THE FOLLOWING CONDITIONS:
   A. LV+ AT TERMINAL "2" OF J-108 SET AT 13.5 VOLTS (FOR 14V RECEIVER) OR 27 VOLTS (FOR 28V RECEIVER) BY ADJUSTMENT OF LV+ SOURCE.
   B. AF CATHODE LINE, TERMINAL "B" OF J-102, GROUNDED
   C. SENSITIVITY LINE, TERMINAL "E" OF J-102, GROUNDED; NO SIGNAL INPUT
   D. 20,000 OHMS-PER-VOLT OR 1,000 OHMS-PER-VOLT VOLTMETER USED, UNLESS OTHERWISE INDICATED
   E. ALL VOLTAGES ARE APPROXIMATE AND ARE MEASURED USING A D-10A DYNAMOTOR AS THE HIGH VOLTAGE SUPPLY. WHEN A D-10 DYNAMOTOR IS USED VALUES WILL BE APPROXIMATELY 10% LESS. VALUES IN PARENTHESES ARE THOSE OBTAINED WHEN DYNAMOTOR SUPPLIES POWER TO TRANSMITTER CONNECTED TO J-103; NO RECEIVER DRAIN.
   F. NEGATIVE TERMINAL OF VOLTMETER GROUNDED TO CHASSIS.
7. REFER TO PARAGRAPH 1-19.
8. DELETED BEGINNING WITH SERIAL NO. 700 OF R-15 (14V) AND SERIAL NO. 1061 OF R-15 (28V).
9. ADDED BEGINNING WITH SERIAL NO. 700 OF R-15 (14V) AND SERIAL NO. 1061 OF R-15 (28V).
10. VALUE CHANGED TO 300 MMF BEGINNING WITH SERIAL NO. 700 OF R-15 (14V) AND SERIAL NO. 1061 OF R-15 (28V)

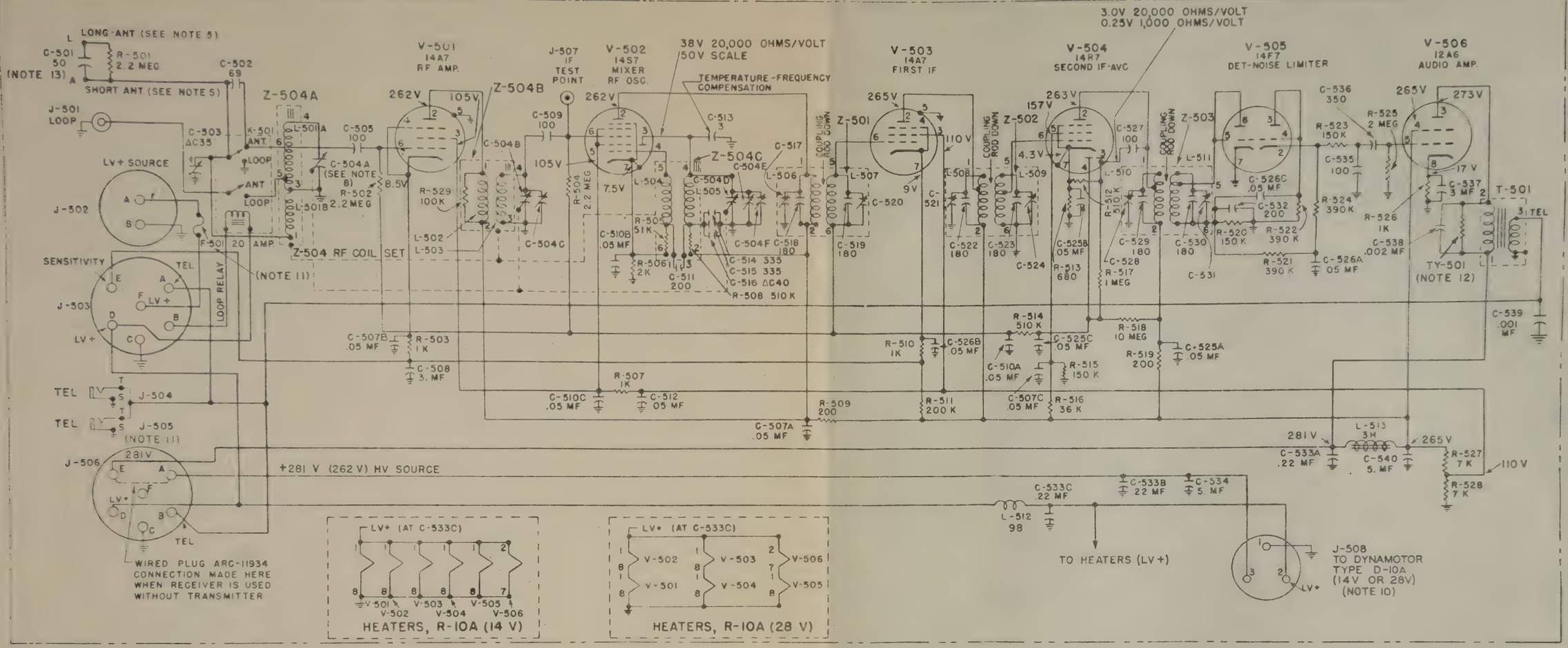
3. Radio Receiver ARC Type R-15(14v) and Type R-15(28v), Schematic Diagram



NOTES

1. CONNECTIONS ARE SHOWN TO WIRED SIDE OF CONNECTORS.
2. CAPACITOR VALUES ARE IN MICROMICROFARADS UNLESS FOLLOWED BY "MF"-MICROFARAD.
3. RESISTOR VALUES ARE IN OHMS UNLESS FOLLOWED BY "K"-KILOHM (1,000 OHMS) OR "MEG"-MEGOHM (1,000,000 OHMS).
4. INDUCTOR VALUES ARE IN MICROHENRIES UNLESS FOLLOWED BY "MH"-MILLIHENRY (1,000 MICROHENRIES) OR "H"-HENRY.
5. THE IF IS 15 MC. THE RF OSCILLATOR FREQUENCY IS 15 MC LESS THAN THE RF SIGNAL FREQUENCY.
6. D-C VOLTAGES SHOWN ARE APPROXIMATE AND TAKEN UNDER THE FOLLOWING CONDITIONS:
   A. LV+ AT TERMINAL "2" OF J-308 SET AT 13.5 VOLTS (FOR 14V RECEIVER) OR 27 VOLTS (FOR 28V RECEIVER) BY ADJUSTMENT OF LVT SOURCE.
   B. AF CATHODE LINE, TERMINAL "B" OF J-302, GROUNDED.
   C. SENSITIVITY LINE, TERMINAL "E" OF J-302, GROUNDED; NO SIGNAL INPUT.
   D. 20,000 OHMS-PER-VOLT OR 1,000 OHMS-PER-VOLT VOLTMETER.
   E. ALL VOLTAGES ARE APPROXIMATE AND ARE MEASURED USING A D-10A DYNAMOTOR AS THE HIGH VOLTAGE SUPPLY. WHEN A D-10 DYNAMOTOR IS USED VALUES WILL BE APPROXIMATELY 10% LESS. VALUES IN PARENTHESES ARE THOSE OBTAINED WHEN DYNAMOTOR SUPPLIES POWER TO TRANSMITTER CONNECTED TO J-303; NO RECEIVER DRAIN.
   F. NEGATIVE TERMINAL OF VOLTMETER GROUNDED TO CHASIS.
7. DELETED BEGINNING WITH SERIAL NO 51 OF R-19 (14V) AND SERIAL NO. 780 OF R-19 (28V)
8. ADDED BEGINNING WITH SERIAL NO. 51 OF R-19 (14V) AND SERIAL NO. 780 OF R-19 (28V)
9. VALUE CHANGED TO 300 MMF BEGINNING WITH SERIAL NO. 51 OF R-19 (14V) AND SERIAL NO. 780 OF R-19 (28V).

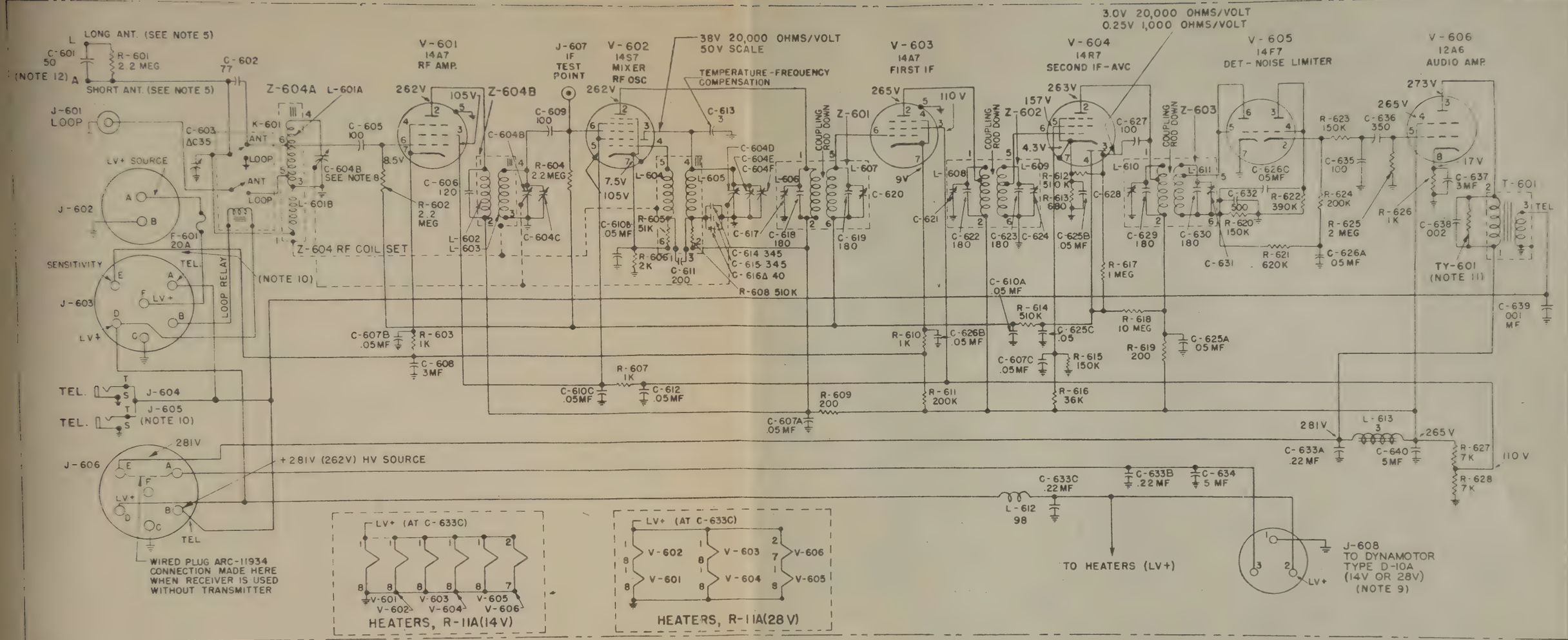
4. Radio Receiver ARC Type R-19(14v) and Type R-19(28v), Schematic Diagram



NOTES:

1. CONNECTIONS ARE SHOWN TO WIRED SIDE OF CONNECTORS.
2. CAPACITOR VALUES ARE IN MICROMICROFARADS UNLESS FOLLOWED BY "MF"–MICROFARAD.
3. RESISTOR VALUES ARE IN OHMS UNLESS FOLLOWED BY "K"–KILOHM (1,000 OHMS) OR "MEG"–MEGOHM (1,000,000 OHMS).
4. INDUCTOR VALUES ARE IN MICROHENRIES UNLESS FOLLOWED BY "MH"–MILLIHENRY (1,000 MICROHENRIES) OR "H"–HENRY.
5. A "SHORT" ANTENNA IS DEFINED AS ONE HAVING AN EFFECTIVE CAPACITANCE OF 21–50 MMF AND A "LONG" ONE AS 50 MMF OR GREATER. BEGINNING WITH SERIAL NO. 365 OF R-10A (14V) AND SERIAL NO. 75 OF R-10A (28V) "A" ANTENNA TERMINAL POST CONNECTION WAS DELETED AND "L" ANTENNA TERMINAL POST WAS MARKED "A".
6. DC VOLTAGE VALUES ARE APPROXIMATE AND ARE BASED ON THE FOLLOWING CONDITIONS:
   - A. HIGH VOLTAGE SUPPLIED BY D-10A DYNAMOTOR. IF D-10 DYNAMOTOR IS USED VOLTAGES WILL BE APPROXIMATELY 10% LESS.
   - B. LV+ AT TERMINAL 2 OF J-508 SET AT 13.5 VOLTS (FOR 14 V RECEIVER) OR 27 VOLTS (FOR 28V RECEIVER) BY ADJUSTMENT OF LV+ SOURCE.
   - C. SENSITIVITY LINE, TERMINAL E OF J-503 GROUNDED; NO SIGNAL INPUT.
   - D. 20,000 OHMS-PER-VOLT OR 1,000 OHMS-PER-VOLT VOLTMETER USED, UNLESS OTHERWISE INDICATED.
   - E. ALL VOLTAGES ARE APPROXIMATE. VOLTAGES IN PARENTHESES ARE THOSE OBTAINED WHEN DYNAMOTOR ALSO SUPPLIES POWER TO A TRANSMITTER CONNECTED TO J-506; NO RECEIVER DRAIN.
   - F. NEGATIVE TERMINAL OF VOLTMETER GROUNDED TO CHASSIS.
7. THE I-F IS 239 KC. ALL THE I-F TRIMMER CAPACITORS HAVE A ΔC OF 17 MMF.
8. EACH TUNING SECTION OF C-504 HAS A ΔC OF 346 MMF. EACH TRIMMER HAS A ΔC OF 16 MMF.
9. SYMBOL NO. C-506 NOT USED.
10. REFER TO PARAGRAPH 1-19.
11. DELETED BEGINNING WITH SERIAL NO. 365 OF R-10A (14V) AND SERIAL NO. 75 OF R-10A (28V).
12. ADDED BEGINNING WITH SERIAL NO. 365 OF R-10A (14V) AND SERIAL NO. 75 OF R-10A (28V)
13. VALUE CHANGED TO 60 MMF BEGINNING WITH SERIAL NO. 365 OF R-10A (14V) AND SERIAL NO. 75 OF R-10A (28V).

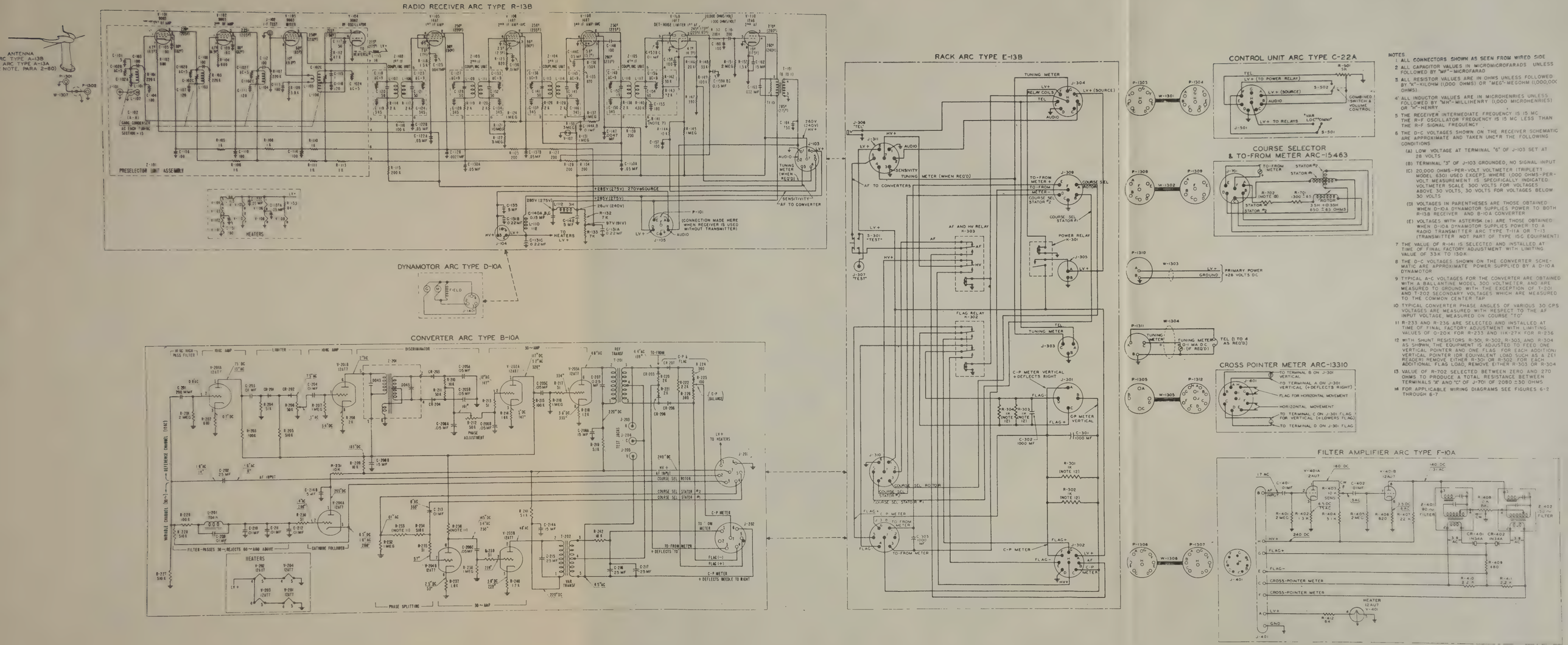
5. Radio Receiver ARC Type R-10A(14v) and Type R-10A(28v), Schematic Diagram



NOTES:

1. CONNECTIONS ARE SHOWN TO WIRED SIDE OF CONNECTORS.
2. CAPACITOR VALUES ARE IN MICROMICROFARADS UNLESS FOLLOWED BY "MF"-MICROFARAD.
3. RESISTOR VALUES ARE IN OHMS UNLESS FOLLOWED BY "K"-KILOHM (1,000 OHMS) OR "MEG"-MEGOHM (1,000,000 OHMS).
4. INDUCTOR VALUES ARE IN MICROHENRIES UNLESS FOLLOWED BY "MH"-MILLIHENRY (1,000 MICROHENRIES) OR "H"-HENRY.
5. A "SHORT" ANTENNA IS DEFINED AS ONE HAVING AN EFFECTIVE CAPACITANCE OF 21-50 MMF AND A "LONG" ONE AS 50 MMF OR GREATER. BEGINNING WITH SERIAL NO. 530 OF R-11A (14V) AND SERIAL NO. 1405 OF R-11A (28V) "A" ANTENNA TERMINAL POST CONNECTION WAS DELETED AND "L" ANTENNA TERMINAL POST WAS MARKED "A".
6. DC VOLTAGE VALUES ARE APPROXIMATE AND ARE BASED ON THE FOLLOWING CONDITIONS:
   A. HIGH VOLTAGE SUPPLIED BY D-10A DYNAMOTOR. IF D-10 DYNAMOTOR IS USED VOLTAGES WILL BE APPROXIMATELY 10% LESS.
   B. LV+ AT TERMINAL 2 OF J-602 SET AT 13.5 VOLTS (FOR 14V RECEIVER) OR 27 VOLTS (FOR 28V RECEIVER) BY ADJUSTMENT OF LV+ SOURCE.
   C. SENSITIVITY LINE, TERMINAL E OF J-603 GROUNDED; NO SIGNAL INPUT.
   D. 20,000 OHMS-PER-VOLT OR 1,000 OHMS-PER-VOLT VOLTMETER USED, UNLESS OTHERWISE INDICATED.
   E. ALL VOLTAGES ARE APPROXIMATE. VOLTAGES IN PARENTHESES ARE THOSE OBTAINED WHEN DYNAMOTOR ALSO POWER TO A TRANSMITTER CONNECTED TO J-606; NO RECEIVER DRAIN.
   F. NEGATIVE TERMINAL OF VOLTMETER GROUNDED TO CHASSIS.
7. THE I-F IS 85 KC. ALL THE I-F TRIMMER CAPACITORS HAVE A ΔC OF 17 MMF.
8. EACH TUNING SECTION OF C-604 HAS A ΔC OF 346 MMF. EACH TRIMMER HAS A ΔC OF 16 MMF.
9. REFER TO PARAGRAPH 1-19.
10. DELETED BEGINNING WITH SERIAL NO. 530 OF R-11A (14V) AND SERIAL NO. 1405 OF R-11A (28V).
11. ADDED BEGINNING WITH SERIAL NO. 530 OF R-11A (14V) AND SERIAL NO. 1405 OF R-11A (28V).
12. VALUE CHANGED TO 60 MMF BEGINNING WITH SERIAL NO. 530 OF R-11A (14V) AND SERIAL NO. 1405 OF R-11A (28V).

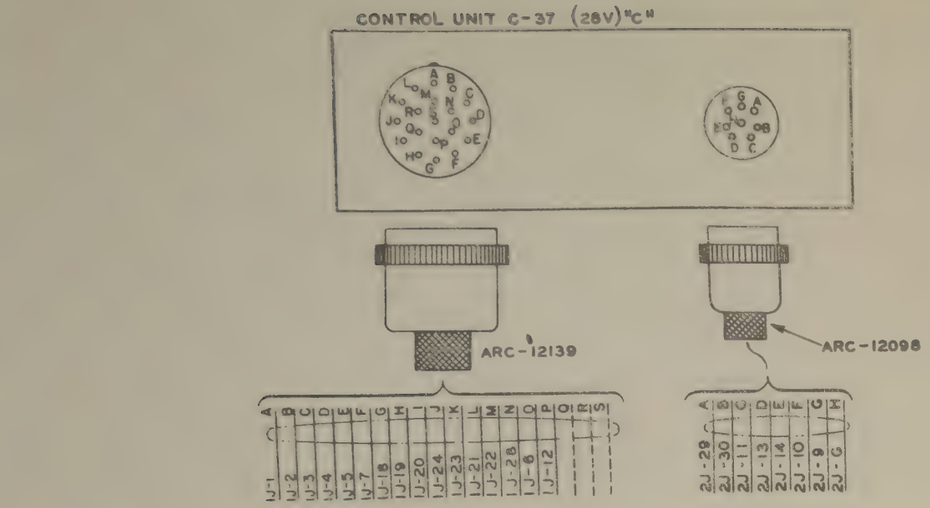
6. Radio Receiver ARC Type R-11A(14v) and Type R-11A(28v), Schematic Diagram

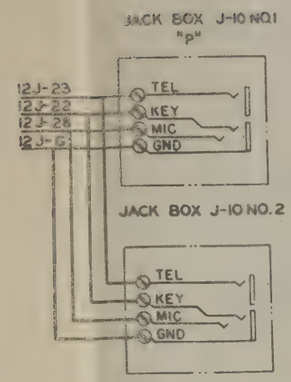


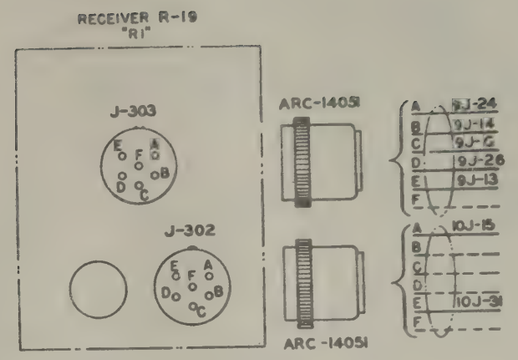
NOTES

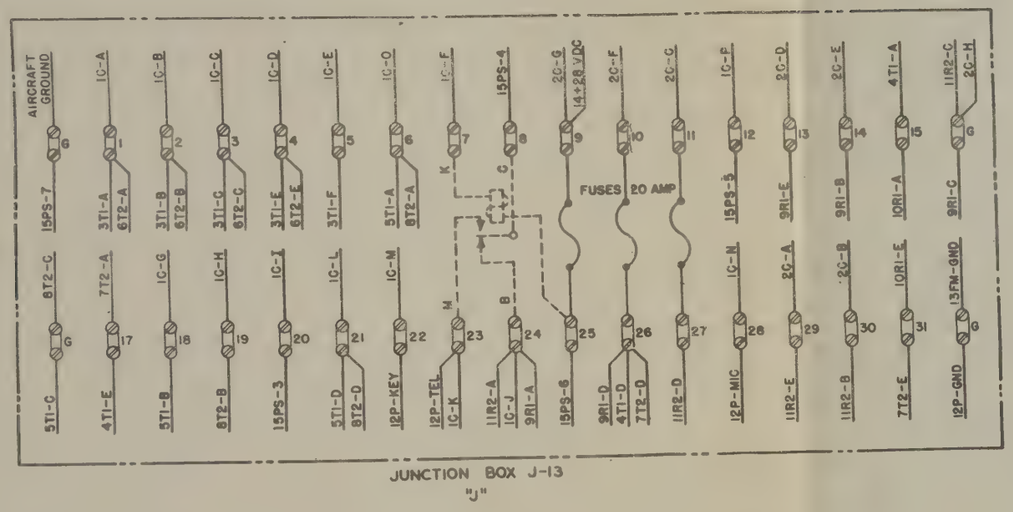
1. ALL CONNECTORS SHOWN AS SEEN FROM WIRED SIDE
2. ALL CAPACITOR VALUES IN MICROMICROFARADS UNLESS FOLLOWED BY "MF"-MICROFARAD
3. ALL RESISTOR VALUES ARE IN OHMS UNLESS FOLLOWED BY "K"-KILOHM (1,000 OHMS) OR "MEG"-MEGOHM (1,000,000 OHMS)
4. ALL INDUCTOR VALUES ARE IN MICROHENRIES UNLESS FOLLOWED BY "MH"-MILLIHENRY (1,000 MICROHENRIES) OR "H"-HENRY
5. THE RECEIVER INTERMEDIATE FREQUENCY IS 15 MC. THE R-F OSCILLATOR FREQUENCY IS 15 MC LESS THAN THE R-F SIGNAL FREQUENCY
6. THE D-C VOLTAGES SHOWN ON THE RECEIVER SCHEMATIC ARE APPROXIMATE AND TAKEN UNDER THE FOLLOWING CONDITIONS:
   (A) LOW VOLTAGE AT TERMINAL "6" OF J-103 SET AT 28 VOLTS
   (B) TERMINAL "3" OF J-103 GROUNDED, NO SIGNAL INPUT
   (C) 20,000 OHMS-PER-VOLT VOLTMETER (TRIPLETT MODEL 630) USED EXCEPT WHERE 1,000 OHMS-PER-VOLT MEASUREMENT IS SPECIFICALLY INDICATED. VOLTMETER SCALE 300 VOLTS FOR VOLTAGES ABOVE 30 VOLTS, 30 VOLTS FOR VOLTAGES BELOW 30 VOLTS
   (D) VOLTAGES IN PARENTHESES ARE THOSE OBTAINED WHEN D-10A DYNAMOTOR SUPPLIES POWER TO BOTH R-13B RECEIVER AND B-10A CONVERTER
   (E) VOLTAGES WITH ASTERISK (*) ARE THOSE OBTAINED WHEN D-10A DYNAMOTOR SUPPLIES POWER TO A RADIO TRANSMITTER ARC TYPE T-11A OR T-13 (TRANSMITTER NOT PART OF TYPE 15C EQUIPMENT)
7. THE VALUE OF R-141 IS SELECTED AND INSTALLED AT TIME OF FINAL FACTORY ADJUSTMENT WITH LIMITING VALUE OF 33K TO 130K
8. THE D-C VOLTAGES SHOWN ON THE CONVERTER SCHEMATIC ARE APPROXIMATE. POWER SUPPLIED BY A D-10A DYNAMOTOR
9. TYPICAL A-C VOLTAGES FOR THE CONVERTER ARE OBTAINED WITH A BALLANTINE MODEL 300 VOLTMETER, AND ARE MEASURED TO GROUND, WITH THE EXCEPTION OF T-201 AND T-202 SECONDARY VOLTAGES WHICH ARE MEASURED TO THE COMMON CENTER TAP
10. TYPICAL CONVERTER PHASE ANGLES OF VARIOUS 30 CPS VOLTAGES ARE MEASURED WITH RESPECT TO THE AF INPUT VOLTAGE, MEASURED ON COURSE "TO"
11. R-233 AND R-236 ARE SELECTED AND INSTALLED AT TIME OF FINAL FACTORY ADJUSTMENT WITH LIMITING VALUES OF 0-20K FOR R-233 AND 11K-27K FOR R-236
12. WITH SHUNT RESISTORS R-301, R-302, R-303, AND R-304 AS SHOWN, THE EQUIPMENT IS ADJUSTED TO FEED ONE VERTICAL POINTER AND ONE FLAG FOR EACH ADDITIONAL VERTICAL POINTER (OR EQUIVALENT LOAD SUCH AS A ZEI READER). REMOVE EITHER R-301 OR R-302 FOR EACH ADDITIONAL FLAG LOAD, REMOVE EITHER R-303 OR R-304
13. VALUE OF R-702 SELECTED BETWEEN ZERO AND 270 OHMS TO PRODUCE A TOTAL RESISTANCE BETWEEN TERMINALS "A" AND "C" OF J-701 OF 2080 ±30 OHMS
14. FOR APPLICABLE WIRING DIAGRAMS SEE FIGURES 6-2 THROUGH 6-7

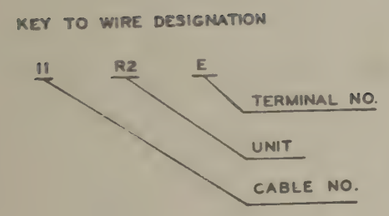
7. *VHF Navigational Receiving Equipment ARC Type 15C, Schematic Diagram*

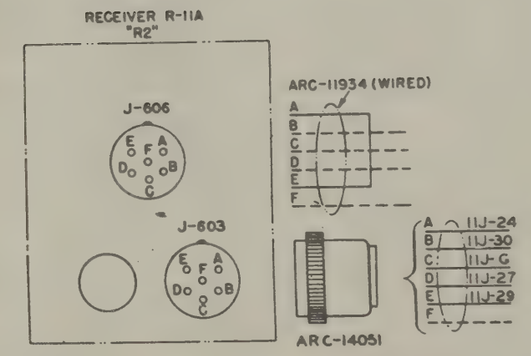


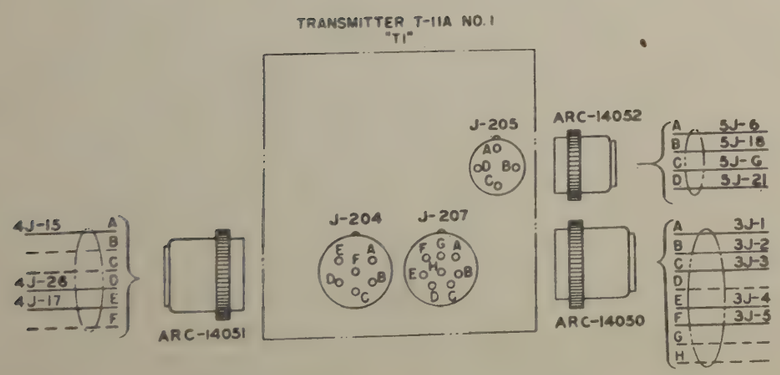


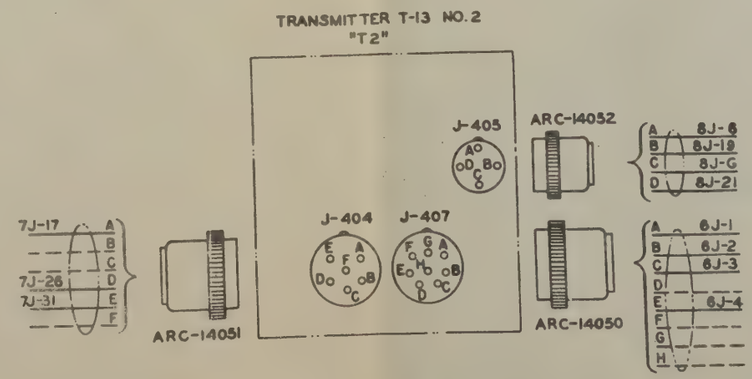


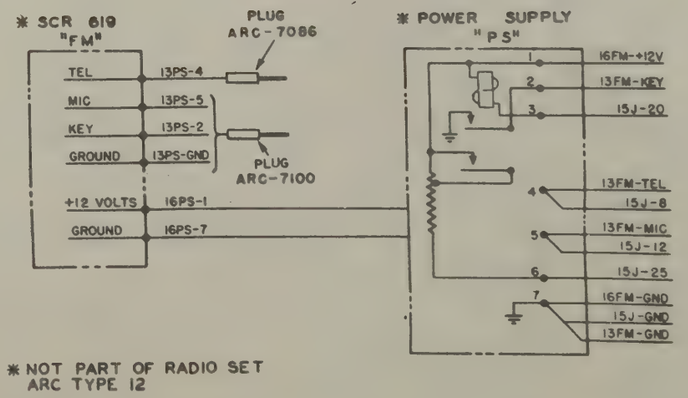












8. Radio Set ARC Type 12, Model L-19A Aircraft Installation, External Wiring Schematic Diagram

THE SOUTHEASTERN SIGNAL SCHOOL
CAMP GORDON, GEORGIA

INFORMATION SHEET

HANDBOOK OF OPERATION AND MAINTENANCE

FOR

RADIO COMPASS

MODEL

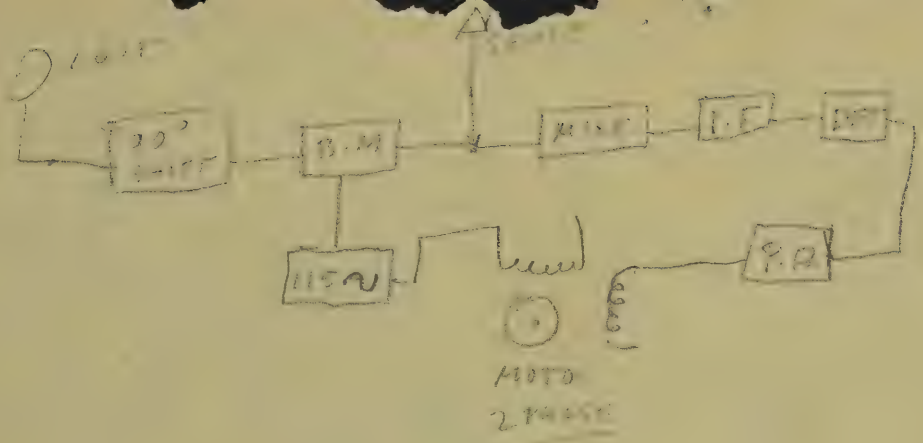
ADF-14

Automatic Direction Finder

11-E-12/10-15

12 6 18
101
5608
18
10.7
0.8 021
120 115
511 021

MAY 1953



BASIC COMPONENTS

1). ANT-ASSEMBLY —

(2). SENSE ANTENNA

(3). TUNER UNIT — (R.F.)

(4). PANEL UNIT (T.F.R.P.S.)

(5). AZIMUTH INDICATOR.

OPERATION

A. TUNER UNIT.

The front panel contains the following operational controls and indicators:

1. COMP-ANT (Function) Switch.
2. Band Switch.
3. Tuning Control and Calibrated Dial.
4. Volume Control.
5. CW OFF-ON Switch.
6. Tuning Indicator.

The Tuner Unit houses the radio receiver circuits necessary for the selection, r-f amplification and conversion to i-f of the radio signals. Further amplification and special modification of the signal for operation of the automatic control circuits are provided by the Amplifier Unit which is electrically connected to the Tuner Unit.

B. DESCRIPTION OF CONTROLS ON TUNER UNIT.

1. COMP-ANT (Function) Switch.

This switch is located in the lower left-hand corner of the panel, and controls the mode of operation of the equipment as follows:

a. ANT.

The equipment functions as a standard radio receiver operating on signals picked up on the sense antenna only. The loop and automatic circuits are inoperative, and the tuning meter also is not used. Headphones and/or a loudspeaker reproduce the signals.

b. COMP.

The equipment functions as an Automatic Direction Finder, making use of both the loop and sense antennas. The heading of the airplane, in degrees, relative to the direction of the location of the station being received is automatically indicated by an Azimuth Indicator. At night, it is important not to use bearings on stations located more than 100 miles away, as serious inaccuracies may result from doing so. Headphones and/or a loudspeaker reproduce the signals.

2. Band Switch.

This switch is located in the lower right-hand corner of the panel and controls the frequency band covered by the Tuning Control as follows:

a. Band Number 1	190 to 440kc
b. Band Number 2	500 to 1050kc
c. Band Number 3	1000 to 1750kc

The band ranges are shown on the panel and are arranged so that the position of the Band Switch knob indicates the band in use. The movement of the Band Switch knob also controls a dial-masking shutter which permits the operator to observe the dial scale of that particular band only. For example, when the Band Switch knob is turned to the 550 to 1050kc band, the dial scales for the other two bands are automatically concealed.

3. Tuning Control and Calibrated Dial.

This control is located directly below the dial at the center of the panel. Clockwise rotation of the control causes clockwise rotation (lower frequencies) of the dial, and similarly, counter-clockwise rotation of the control results in counter-clockwise rotation (higher frequencies) of the dial.

4. Volume Control.

This control is located in the upper left-hand corner of the panel. Clockwise rotation of the control increases the volume of reproduced signals, and counter-clockwise rotation decreases the volume.

5. CW OFF-ON Switch.

This switch is located in the upper right-hand corner of the panel, and turns the Beat Frequency Oscillator (BFO) on (right) and off (left). The BFO may be used as an aid in tuning a station too weak to hear, but still strong enough for the equipment to perform as a Direction Finder. With the CW switch "ON", tuning is accomplished by rotating the Tuning control back and forth around the desired station, and listening for zero beat, on either side of which a whistle will be heard. When the zero beat point is reached, the Tuning Indicator should simultaneously show maximum indication. The CW switch may now be turned "OFF".

6. Tuning Indicator.

This indicator is located between the Tuning dial and the CW switch, and is used as an aid in correctly tuning to a station. The Tuning control is rotated for maximum indication on the meter for a given station. See paragraph 5, Section III, for tuning procedure with CW switch "ON".

C. AMPLIFIER UNIT.

This unit contains the circuits and components associated with the i-f amplifier, demodulator, audio and power amplifiers, compass amplifier, and the automatic control functions. The rear of the unit also

I.F 465 KC

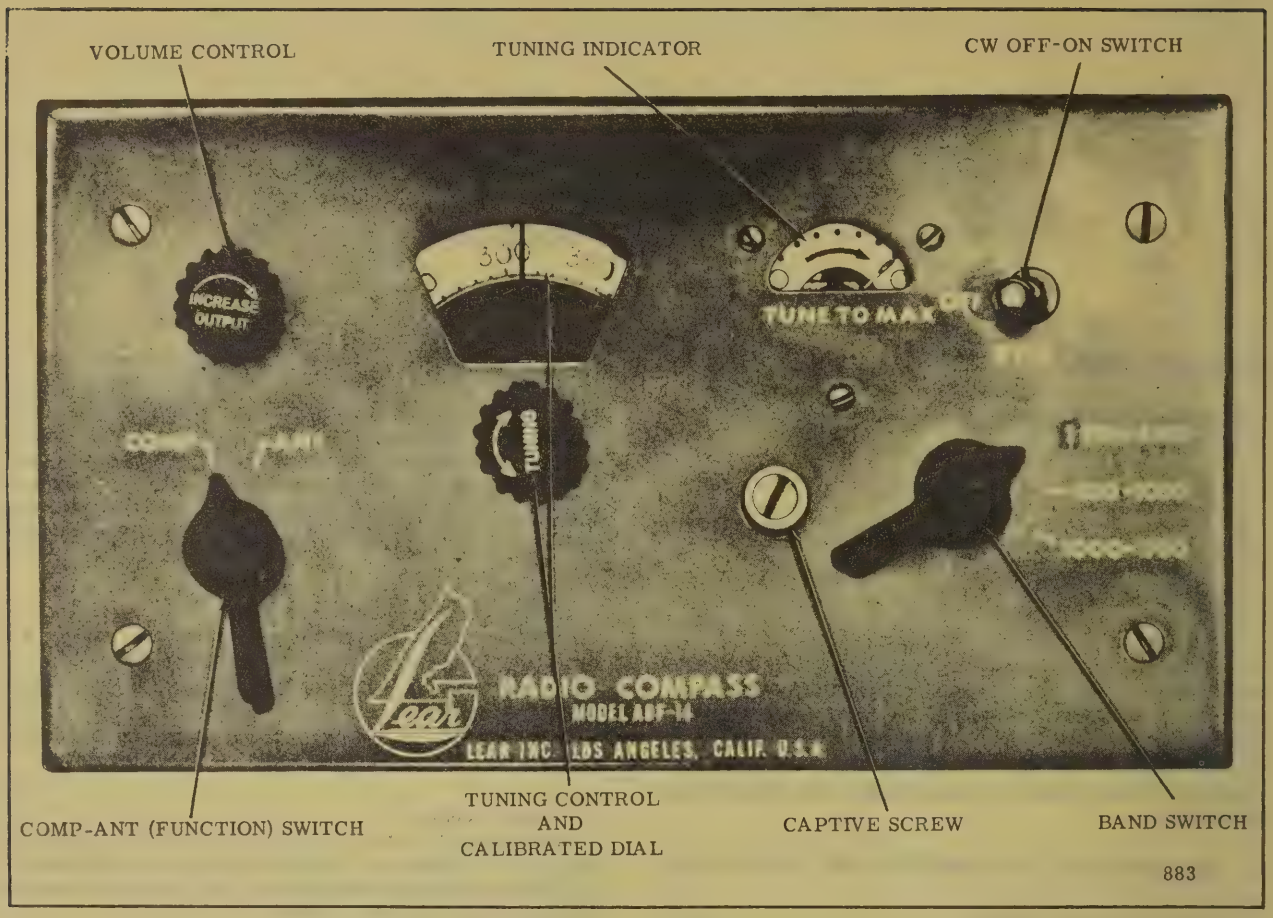


Figure 3-1. Front Panel Controls on Tuner Unit

houses the power supply components. The unit has no controls on its panel. It contains the necessary receptacles for the cables, which may be of any required length, electrically connecting the amplifier to the other units.

D. AZIMUTH INDICATOR.

This instrument is a separate unit which may be mounted on the airplane instrument panel. The circular scale is calibrated in degrees of azimuth. The "0" degrees position normally is used in "homing" or flying directly toward a radio station that has been tuned in on the Orienter.

The indicator is electrically connected to the loop antenna assembly by a cable of any required length.

E. LOOP ANTENNA ASSEMBLY.

The loop antenna assembly contains the loop antenna, motor and associated gears for rotating the loop, and the indicator transmitter which permits indications to be obtained on the Azimuth Indicator remotely mounted on the instrument panel. The loop antenna assembly is protected by a tight-fitting, plastic housing. The loop antenna assembly is electrically connected to the Amplifier Unit and the Indicator by a cable of any required length and to the Tuner Unit by a cable having any length between 10 and 46 feet.

GENERAL MAINTENANCE

A. OVER-ALL BLOCK DIAGRAM AND CIRCUIT DESCRIPTION.

Figure 4-1 is an overall block diagram of the equipment. A brief description of the overall operation of the equipment follows:

1. ANT.

As mentioned in Section III, in the "ANT" position the equipment functions as an ordinary radio receiver, with the automatic control circuits disconnected. The signal picked up by the sense antenna is fed to the r-f amplifier VT-3, and converted to an i-f frequency of 465kc by the converter tube, VT-4. The gain of VT-3 and VT-4 is varied by the "R.F. GAIN" control. The resulting i-f signal is amplified by the two-stage i-f amplifier, VT-101 and VT-102, and fed to the second detector, the diode section of VT-103. The AVC circuit is not used in this mode of operation. The resulting audio is then passed to the first section of the twin triode a-f voltage amplifier, VT-107. The second section of VT-107 serves as a phase inverter. The output stage is a push-pull amplifier, VT-105 and VT-106. The audio output is fed to headphones and/or a loudspeaker.

2. COMP.

In this position, the equipment functions as a compass receiver, utilizing both the loop and sense antennas. An important characteristic of the loop antenna is that the signal picked up by it is 90 degrees out of phase with that picked up by the sense antenna. The signal picked up by the loop antenna is fed to the r-f amplifier VT-1. The output signal from VT-1 is subjected to a phase lag of 90 degrees and is then fed to VT-2 which is a balanced modulator. A signal of 115 cps is also introduced into this stage in such a manner that the r-f output is modulated at 115 cps in a phase determined by which edge of the loop is nearer the transmitter. The output signal from VT-2 is combined at the grid of VT-3 with the signal picked up by the sense antenna. The two signals add either constructively (in phase) or destructively (out of phase). The resulting signal is amplified by VT-3, converted to 465kc by VT-4, amplified at the i-f frequency by VT-101 and VT-102, and finally detected by VT-103. The resulting 115 cps output voltage from VT-103 is either in phase or out of phase with respect to the original 115 cps voltage applied to VT-2. This output voltage is fed through a suitable phase shifting network to the compass voltage amplifier, VT-107, in an arrangement similar to that used for audio reception. The output stage is a push-pull amplifier, VT-108 and VT-109, with the secondary of the output transformer feeding one winding of the loop motor. The direction of rotation of this motor is determined by the phase (+90° or -90°) of the 115 cps voltage applied to one winding with respect to that applied to the other winding. This phase, in turn, is determined by the position of the loop.

A 115 cps voltage, derived from the power supply and of the same phase as that fed to VT-2, is applied to the other winding of the loop motor. A 115 cps voltage derived from the loop signal will cause the loop motor to rotate the loop to the null position where no signal is received. The Azimuth Indicator, which is driven by the indicator synchro transmitter, will now indicate the heading of the airplane, in degrees, relative to the direction of the radio transmitter location.

B. THEORY OF TUNER UNIT.

1. ANT.

a. R-F Amplifier.

In this position, switch S7 opens the cathode of the loop amplifier and balanced modulator, VT-1 and VT-2 respectively, (described in paragraph 2 of this section) and also short circuits the AVC voltage for these stages. The signal picked up by the sense antenna is fed to the r-f amplifier, VT-3, a type 12BA6 remote-cutoff pentode. Switch S3 selects the proper coil for the grid circuit according to the desired frequency band. In addition, switch S3 also effectively grounds the electrically ungrounded terminals of the unused coils to avoid interaction between them. Since the AVC circuit is not used, the r-f gain must be controlled manually, and R8 is used for this purpose by varying the cathode bias of VT-3 and VT-4, the converter. R6 and R11, respectively, provide minimum bias and prevent overloading the two stages when the "R.F. Gain" control is in the maximum gain position. Switch S4-A selects the primary of T7, T8, or T9 as the load for VT-3, and the signal is induced in the corresponding secondary as determined by S4-B. As in other sections of this switch, S4-A short circuits and effectively grounds the unused primaries, and S4-B connects the ungrounded terminals of the unused secondaries together.

b. Converter Stage.

VT-4 is a type 12BE6 pentagrid converter and combines, in one tube, the oscillator and mixing functions. The oscillator elements are the cathode, pin 2, the grid, pin 1, and the screen grid, pin 6, acting as the oscillator plate. These elements form a Hartley oscillator in conjunction with the coil T10, T11, or T12, and associated capacitors, selected by S5-A and S5-B, which also effectively cuts the unused coils out of the circuit. The remaining elements in the tube, along with the common cathode, act as the mixer section of the converter, with the coupling of the oscillator voltage accomplished by the common electron stream. The resulting 465kc i-f signal developed in the primary of T13 is induced in the secondary.

2. COMP.

a. R-F Amplifier.

In this operation, the signal from the loop antenna is fed to the primary of the r-f coil, T1, T2, or T3, selected by S1, and is inductively transferred to the

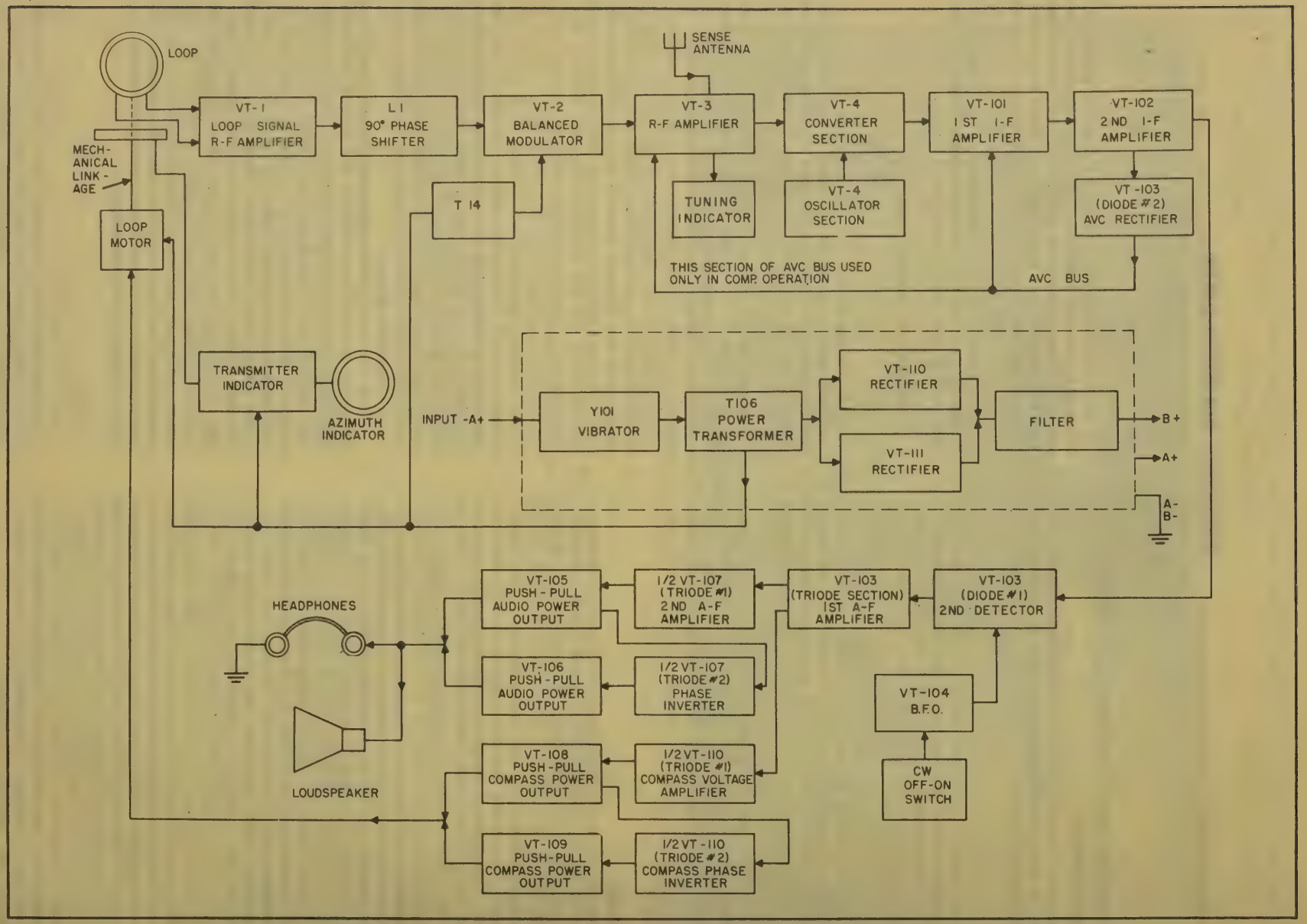


Figure 4-1. Functional Block Diagram

corresponding secondary and the grid of the r-f amplifier VT-1, type 12BA6 remote-cutoff pentode. S1-A also short circuits unused primaries, while S1-B grounds unused secondaries. Resistor R1 and capacitor C7 provide cathode bias for this stage. As mentioned in Section III, the signal picked up by the loop and that picked up by the sense antenna are in phase quadrature, in a sense determined by which edge of the loop is nearest the transmitter (figure 4-2, A and B). The output circuit of VT-1, coil L1 and capacitor C9, resonates well below the lowest frequency received, so the voltage applied to VT-2 is retarded 90 degrees with respect to the original loop signal. This phase shift makes the resulting signal either in phase or out of phase with the signal picked up by the sense antenna (figure 4-2, C).

b. Balanced Modulator.

The signal is coupled by capacitors C10 and C11 to the grids of the balanced modulator VT-2, a type 12AU7 twin triode (figure 4-2, D). Resistor R4, unbypassed, supplies cathode bias. The two grids of VT-2 are effectively placed in parallel for r-f by capacitor C12. A 115 cps modulating voltage from the power supply is also impressed on the grids in phase opposition, through resistors R2 and R3, respectively, which are connected to opposite ends of autotransformer T14 (figure 4-2, E and F). The effect of this 115 cps voltage is that first one section of tube VT-2 amplifies the signal, and then the other. Since the plates of VT-2 feed opposite ends of the center-tapped primary of the interstage coupling transformer, either T4, T5, or T6, as selected by switch S2-A, the result is equivalent to shifting the effective primary of the transformer from one half of the winding (terminals 8 and 7) to the other half of the winding (terminals 6 and 7). This action reverses the phase of the signal induced in the secondary of the transformer selected by switch S2-B (figure 4-2, G and H). Switch S2 also effectively short circuits and grounds the unused coils.

c. Common R-F Amplifier.

The signal thus derived from the loop antenna and that received on the sense antenna are combined in the secondary of the selected interstage coupling transformer. The two signals are thus either in phase or out of phase with each other, with the signal from the loop antenna modulated by 115 cps in addition to the modulation, if any, being transmitted (figure 4-2, I and J). The combined signals are amplified by the r-f amplifier VT-3. Cathode bias for this stage is provided by resistor R6 and capacitor C21. Switch S7 short circuits R8. A meter M in the cathode circuit of VT-3 serves as a tuning indicator. AVC voltage is applied to the grid by a decoupling network composed of resistor R5 and capacitor C18.

d. Converter Stage.

The composite signal is fed to VT-4, the pentagrid converter, and converted to a 465kc i-f signal, as described under "ANT" of this section. However, in the present COMP operation, the cathode bias of tube VT-4 is fixed by resistor R11. The resulting 465kc i-f signal developed in the primary of T13 is induced in the secondary.

e. I-F Coupling System.

Since the i-f amplifier is in a separate unit, and since it would be difficult to transfer the signal at a high impedance from one unit to the other, an impedance transformation is effected by capacitor C30 in the tuner in conjunction with capacitor C140 in the i-f amplifier section of the Amplifier Unit. A simplified schematic of the i-f coupling between the units is shown in figure 4-3. R_{L13} and R_{L101} represent the internal loss resistances of transformer T13 secondary and transformer T101 primary, respectively. The circuit may be analyzed by theoretically disconnecting the cable between the units and observing the impedance first at the output of the Tuner Unit, and then at the input of the Amplifier Unit. Figure 4-3B shows that the impedance looking toward the output of the tuner, terminals 6 and 4 of transformer T13, consists of the capacitive reactance of C30, the inductive reactance of T13 secondary, and R_{L13}, all in series. Since the circuit is tuned to resonance, the two reactances cancel, and the impedance at terminals 6 and 4 of T13 is the low value of R_{L13}, the loss resistance. The impedance looking toward the input of the i-f amplifier, terminals 6 and 4 of T101, is likewise the low value of R_{L101}. Hence a low impedance cable may be connected between these two low-impedance points. Capacitor C140, 0.01 mfd, has low reactance to the 465kc i-f signal, and so serves to connect capacitor C30 across the secondary of T13, and capacitor C101 across the primary of T101, respectively. Thus, as far as tube VT-4 is concerned, the secondary of transformer T13, in conjunction with capacitor C30, acts like a parallel-tuned resonant circuit (high impedance), which it is between terminals 3 and 4. Similarly, the grid of VT-101, the primary of T101, with C101, behaves as a parallel-tuned resonant circuit which it is between terminals 3 and 4.

C. THEORY OF AMPLIFIER UNIT.

In the following paragraphs, the theory of operation of the various circuits of the unit is discussed. Differences in circuit operation caused by turning switch S7 from "COMP" to "ANT" positions will be discussed as they arise in the respective sections.

1. I-F Amplifier.

The i-f amplifier consists of two stages, VT101 and VT102, each utilizing a type 6BJ6 remote-cutoff pentode. Cathode bias for each stage is provided by resistor R101 and capacitor C141, and resistor R107 and capacitor C142, respectively. With switch S7 in the "COMP" position, the full AVC voltage is fed by a decoupling network composed of resistor R105 and capacitor C107 to the grid of tube VT101. The AVC voltage applied to this stage is reduced when switch S7 is in the "ANT" position. The coupling between stages is by a conventional interstage transformer T102.

2. Second Detector and AVC Rectifier.

The signal from tube VT-102 is inductively coupled by transformer T103 to the second detector, a diode section, pin 6 of VT-103, a type 6AT6. Resistors R111 and R112 constitute the load and voltage divider for this section of VT-103. The portion of the audio signal across resistor R112 is coupled by capacitor C118 to the grid of the triode section of this same tube.

The signal from tube VT-102 is also capacitively coupled by C114 to the other diode of VT-103, which serves as the AVC rectifier. The AVC voltage is developed across resistor R110, filtered by resistor R109 and capacitor C138, then fed to the various stages by appropriate decoupling networks, as already described.

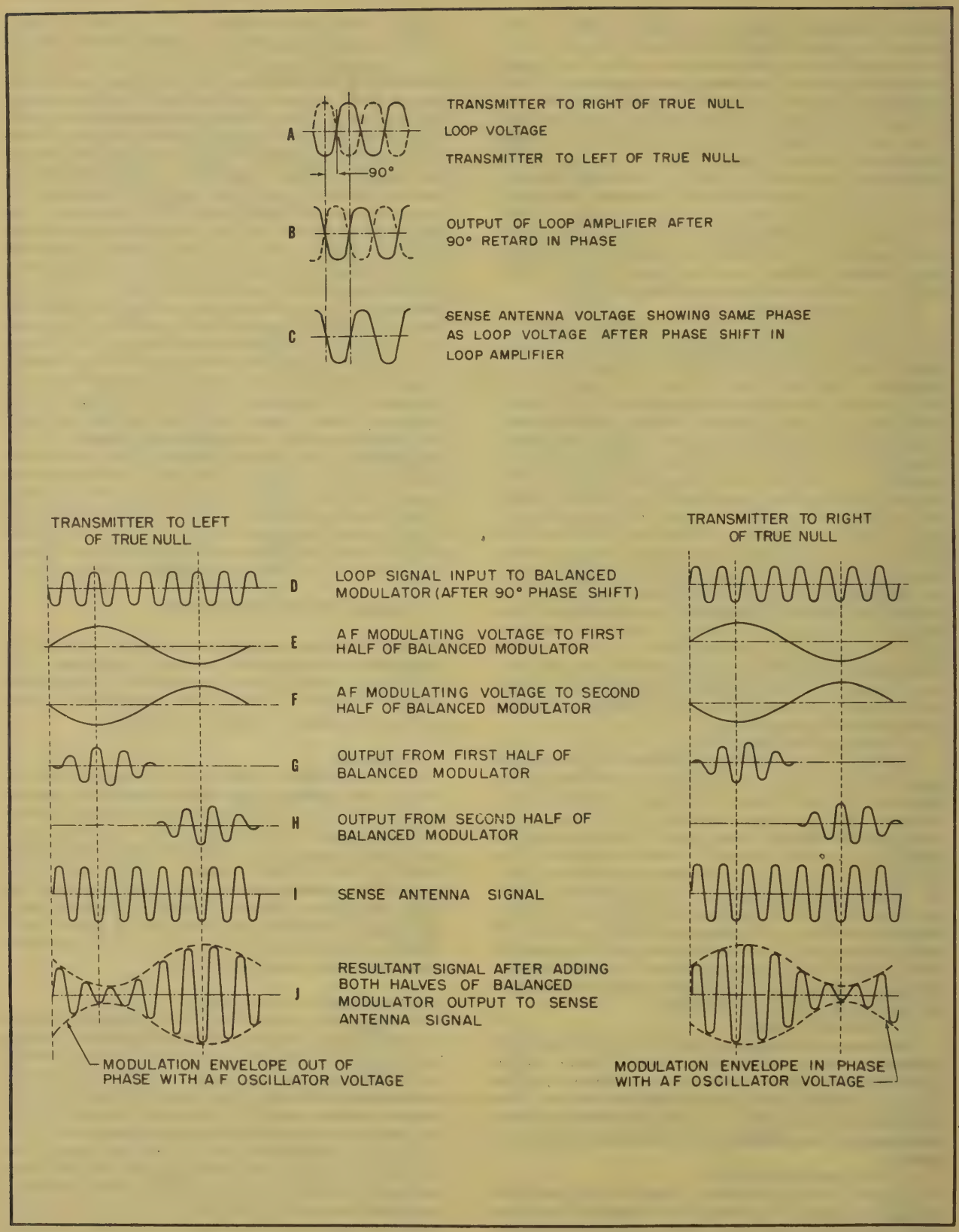

A
90°
TRANSMITTER TO RIGHT OF TRUE NULL
LOOP VOLTAGE
TRANSMITTER TO LEFT OF TRUE NULL
B
OUTPUT OF LOOP AMPLIFIER AFTER 90° RETARD IN PHASE
C
SENSE ANTENNA VOLTAGE SHOWING SAME PHASE AS LOOP VOLTAGE AFTER PHASE SHIFT IN LOOP AMPLIFIER
TRANSMITTER TO LEFT OF TRUE NULL
TRANSMITTER TO RIGHT OF TRUE NULL
D
LOOP SIGNAL INPUT TO BALANCED MODULATOR (AFTER 90° PHASE SHIFT)
E
A F MODULATING VOLTAGE TO FIRST HALF OF BALANCED MODULATOR
F
AF MODULATING VOLTAGE TO SECOND HALF OF BALANCED MODULATOR
G
OUTPUT FROM FIRST HALF OF BALANCED MODULATOR
H
OUTPUT FROM SECOND HALF OF BALANCED MODULATOR
I
SENSE ANTENNA SIGNAL
J
RESULTANT SIGNAL AFTER ADDING BOTH HALVES OF BALANCED MODULATOR OUTPUT TO SENSE ANTENNA SIGNAL
MODULATION ENVELOPE OUT OF PHASE WITH A F OSCILLATOR VOLTAGE
MODULATION ENVELOPE IN PHASE WITH AF OSCILLATOR VOLTAGE

Figure 4-2. Signal Wave Forms, COMP Position

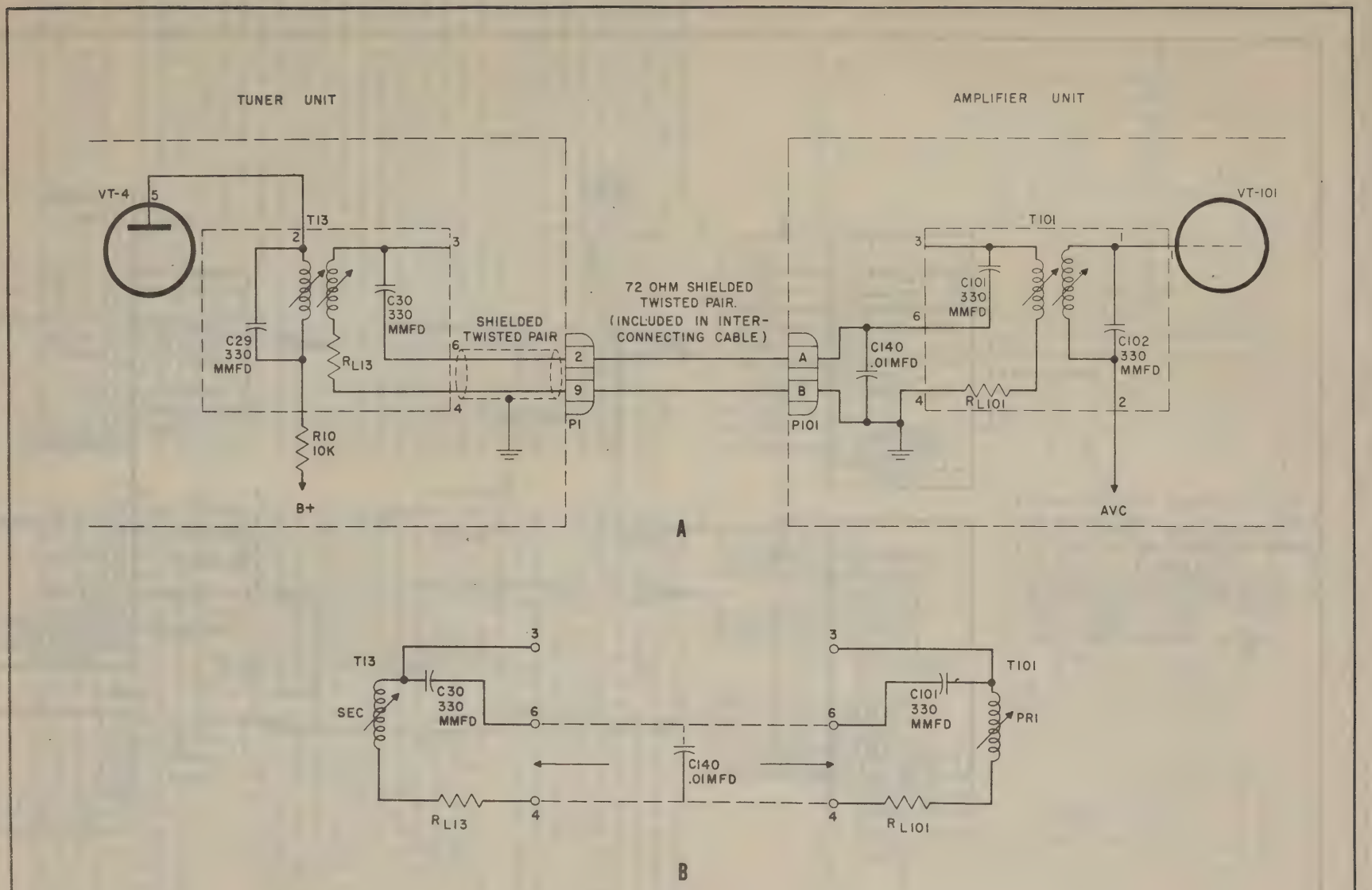


Figure 4-3. Partial Schematic of I-F Coupling System

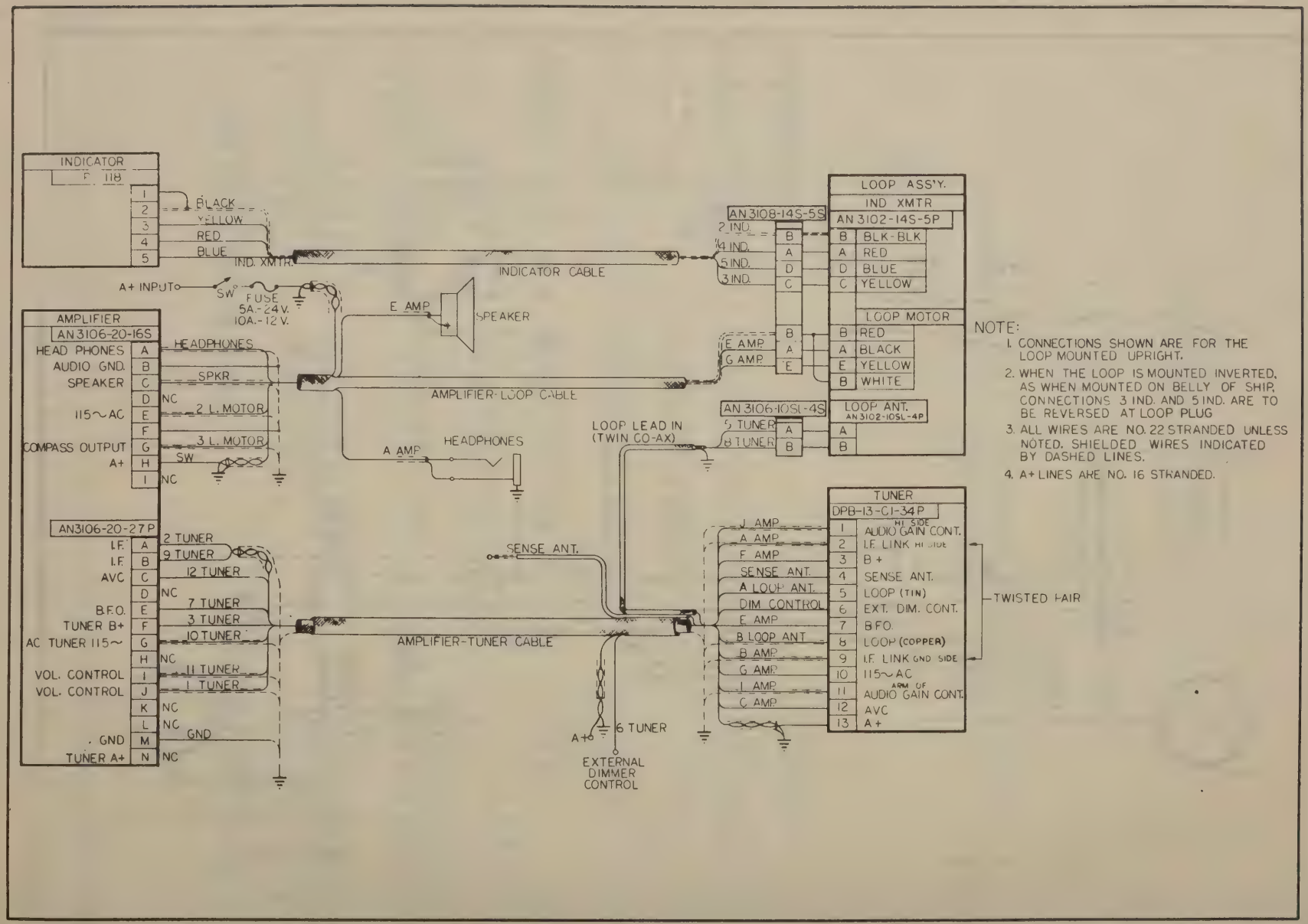


Figure 4-4. Cabling Diagram

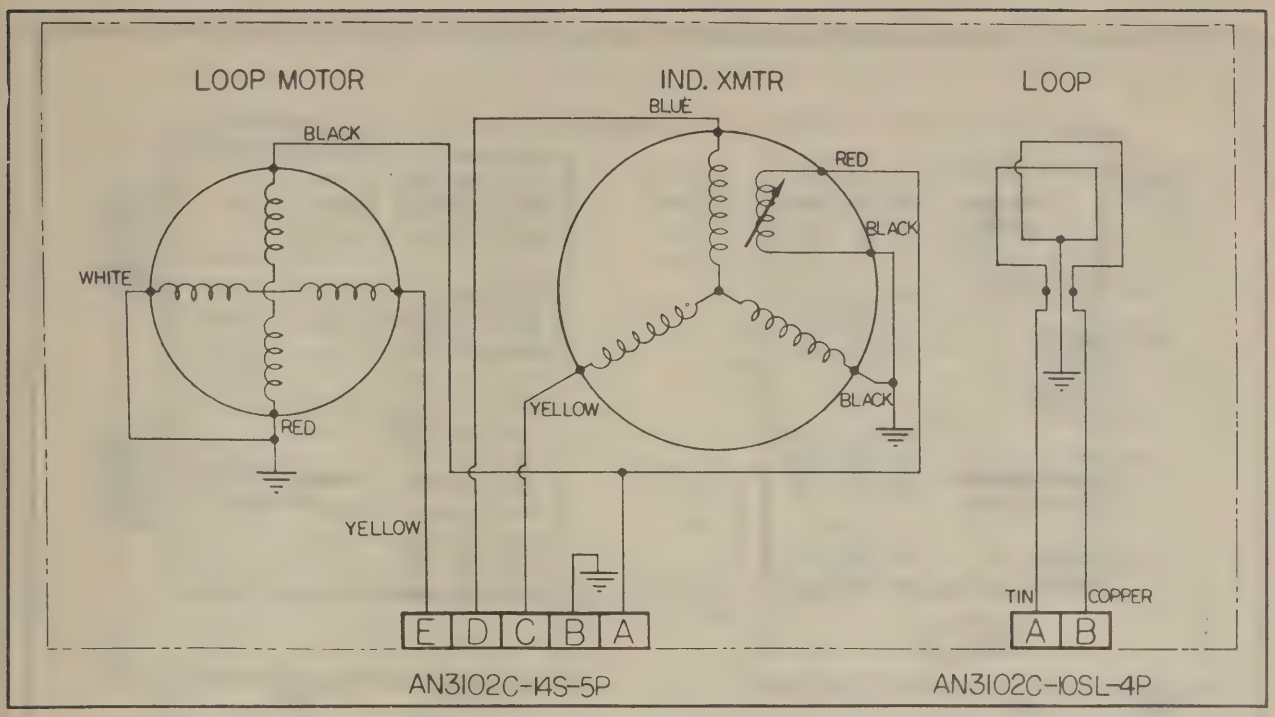


Figure 4-5. Schematic of Loop

3. Beat Frequency Oscillator.

The triode section of tube VT-104, a type 6AT6, is used as the Beat Frequency Oscillator (BFO), arranged in a Hartley oscillator circuit in conjunction with transformer T107 and associated components. Switch S6, in the Tuner Unit, turns the BFO on by completing the cathode circuit. The plate voltage for this stage is 12 volts and is obtained, with a 24 volt d-c primary source, from the appropriate point in the series-connected tube heaters. With a 12 volt d-c primary supply, the plate voltage for tube VT-104 is obtained directly from the primary source. Coupling from the BFO to the second detector, VT-103, is accomplished through capacitor C109 and the capacity of two turns of insulated wire wrapped around the lead going to pin 6 of VT-103. The BFO is adjusted at the factory to operate on a frequency of 465kc. Both this voltage, and that of the i-f carrier of the received signal, are introduced into the second detector. The two voltages will beat with each other upon detection and produce a resultant audio voltage whose frequency is the difference between 465kc and the i-f of the received carrier signal. When a signal is correctly tuned in, the i-f signal produced from its carrier will have a frequency of exactly 465kc and therefore a difference frequency of zero, or zero beat, will occur at this point. The signal will be tuned to its maximum strength at this point, as indicated by the tuning meter in the cathode circuit of tube VT-3.

4. A-F Voltage Amplifier.

The a-f signal at the plate of tube VT-103 is divided by resistors R113 and R117. The portion of the a-f voltage across resistor R117 is coupled by capacitor C120 to the "AUDIO GAIN" control R12, actually mounted in the Tuner Unit, and mechanically ganged to R8, the "R.F. GAIN" control. From here the a-f voltage is fed to the grid, pin 7, of a second a-f voltage amplifier, one section of twin triode VT-107, type 12AX7. A suitable network limits the response of the a-f amplifier at the lower audio frequencies, so that very little 115 cps signal passes through this amplifier. The common unbypassed resistor R126 provides cathode bias for both sections of VT-107.

The audio voltage developed at resistor R123, the load for the first section of the tube, is coupled by capacitor C123 to the grid of one of the power output amplifiers, VT-105, which is connected in push-pull with VT-106. A voltage divider, resistors R120 and R121, feeds the proper amount of voltage to the grid, pin 2, of the other section of VT-107. This section serves as a phase inverter driving the grid of the other power output amplifier VT-106. The output from one section of VT-107 is of equal magnitude and opposite phase with that from the other section of VT-107. Thus the grids of the push-pull output amplifier are driven in the proper manner.

5. Audio Power Output Amplifier.

The audio power output stage is a conventional push-pull amplifier employing two power pentodes VT-105 and VT-106, type 6AK6. Bias is obtained by the unbypassed common cathode resistor R119. The output from this stage is coupled to either a loudspeaker or headphones by output transformer T104. The loudspeaker is connected to terminals 4 and 5 (ground) of T104, and the low-impedance headphones are connected

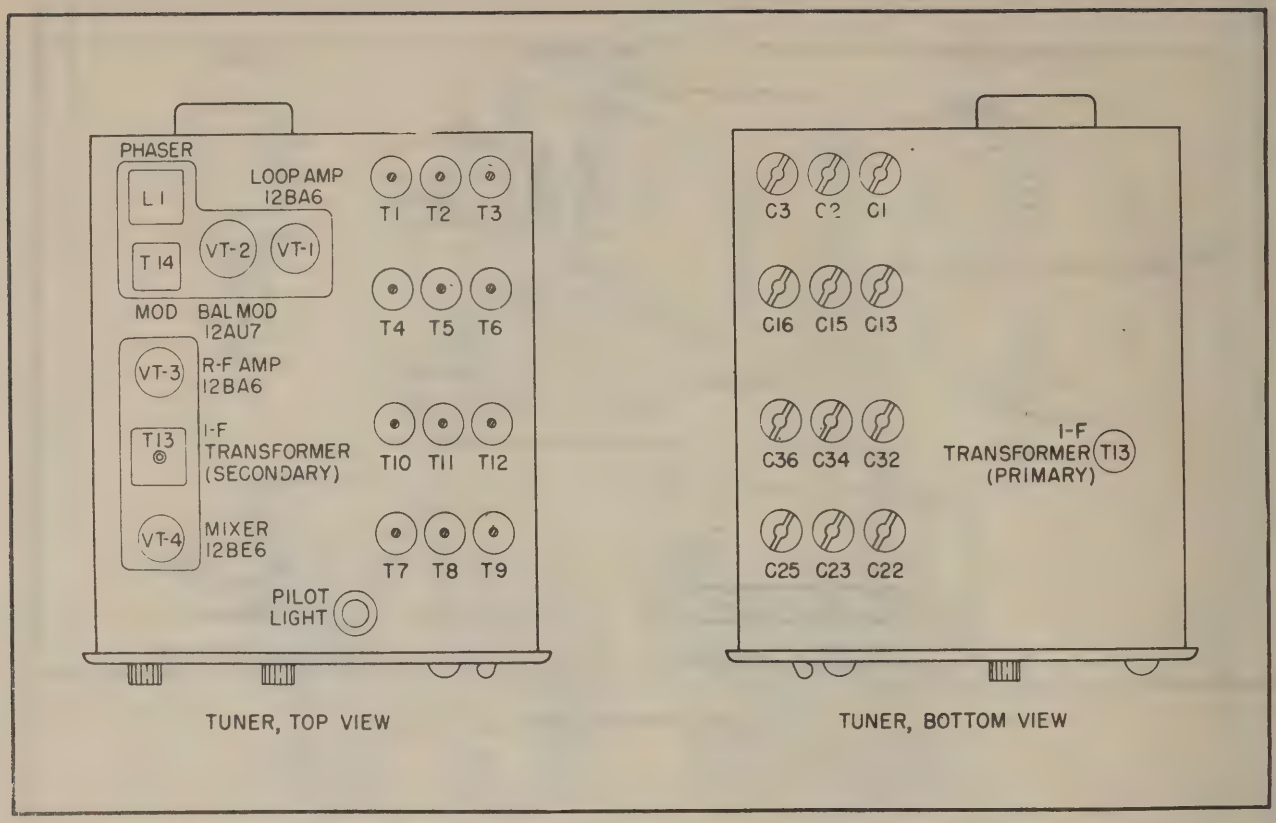


Figure 4-6. Tuner Unit Tube Layout and Alignment Location

to terminals 6 and 5. Both types of reproducers are connected through a plug, P102.

6. COMP Voltage Amplifier.

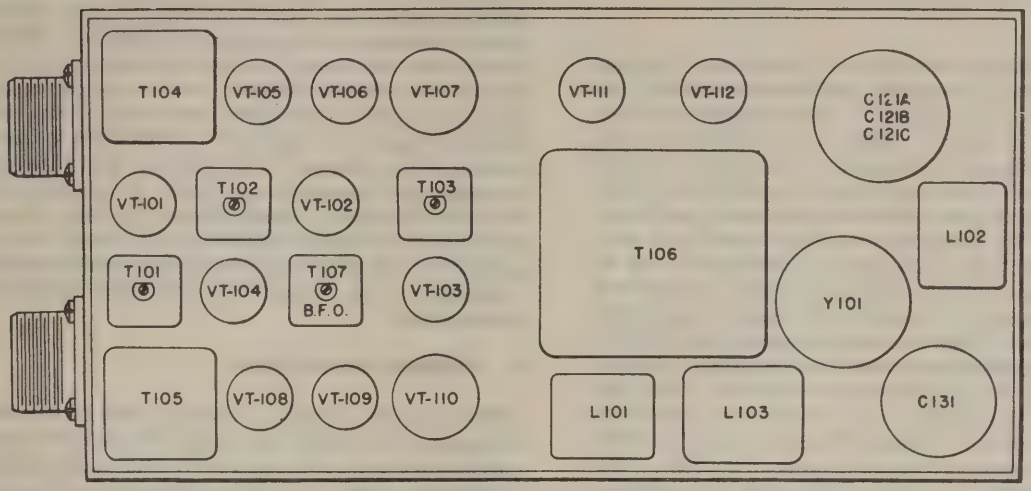
The entire a-f voltage at the plate of tube VT-103 is coupled by capacitor C129 through a dividing and low-pass filter network, composed of resistors R134, R135, and capacitor C130, to the grid, pin 7, of another voltage amplifier, one section of twin triode VT-110, type 12AX7. The filter action of the network permits the 115 cps voltage to be applied to VT-110, but proportionately reduces the amplitude of the higher audio frequencies. The network also provides enough phase shift so that, together with that provided by the remainder of the circuit, the voltage applied to the loop motor by the COMP power amplifier lags by 90° the output voltage from the second detector, VT-103. Cathode bias is supplied to both sections of tube VT-110 by the unbypassed common resistor R133.

The 115 cps voltage developed at resistor R131, the load for this section of the amplifier, is coupled by capacitor C127 to the grid of one of the output amplifiers, VT-108, which is connected in push-pull with VT-109. A voltage divider, resistors R128 and R129, feeds the proper amount of voltage to the grid, pin 2, of the other section of VT-110. This section serves as a phase inverter driving the grid of the other power output amplifier VT-109. This arrangement provides the proper magnitude and phase of grid driving voltage for the push-pull output stage.

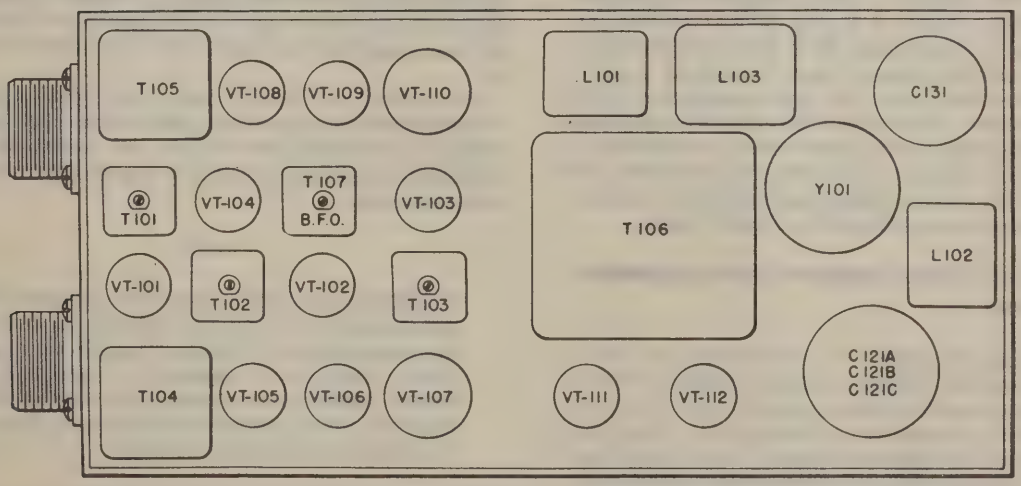
7. COMP Power Output Amplifier.

The COMP power output stage is a push-pull amplifier employing two power pentodes, VT-108 and VT-109, type 6AK6. Bias is obtained by the unbypassed cathode resistor R127 in addition to 12 volts obtained by using the tube heaters as a voltage divider across the 24-volt d-c primary supply. With a 12-volt supply, resistor R127 is connected to the 12-volt source. The output from this stage is fed to output transformer T105, which is tuned to 115 cps by capacitor C126 in the primary winding, and capacitor C125 in the secondary winding. Resonance is required to insure that the 115 cps voltage fed from the amplifier to one motor winding is 90° out of phase with that furnished by the power supply to the other motor winding.

The secondary of the output transformer T105 is connected through plug P102 to one winding of the loop motor. The other winding of the loop motor is supplied with fixed phase 115 cps voltage. As explained in Section IV, the motor will turn the loop in such a direction that the loop will be brought to a null position where no signal is received by it. Actually, the loop will overshoot the null position somewhat, resulting in a phase reversal



AMPLIFIER, TOP VIEW



AMPLIFIER, BOTTOM VIEW

NOTE: PRIMARIES, OF I-F TRANSFORMERS T101, T102, AND T103 ARE TUNED FROM BOTTOM, SECONDARIES FROM TOP.

Figure 4-7. Amplifier Unit Tube Layout and Alignment Location

which causes the motor to turn the loop in the opposite direction, overshooting again, and so on. This continuous reversing is known as hunting and is a positive indication that the equipment is functioning.

8. Power Supply.

The power supply furnishes all operating voltages for the equipment. A vibrator, fed through a hash filter composed of inductance L101 and capacitor C131, interrupts the 24-volt d-c source at a 115 cps rate, and applies the voltage alternately to terminals 1 and 3, and then 2 and 4 of the primary of transformer T106. It accomplishes this by alternately grounding terminals 1 and 4, since the common terminals 2 and 3 are permanently connected to the ungrounded side of the 24 volt d-c supply through the hash filter and current limiting resistors R137 and R138. Buffer capacitors C133, C134, and C139 are used in conjunction with the high voltage secondary to prevent high surges of current from damaging the contacts of the vibrator. The high a-c voltage obtained between terminals 7 and 10 is rectified by tubes VT-111 and VT-112, each a type 6X4, and together connected as a full-wave rectifier. The resulting pulsating d-c voltage is filtered by capacitors C135, C136, C121-B, C121-C, resistor R142 and inductance L103, and distributed to the required points in the Amplifier Unit, and in the Tuner Unit through plug P101, the cable, and plug P1. A separate winding on transformer T106, brought out by terminals 11 and 12, supplies 115 cps, fixed phase voltage to transformer T14, tube VT-2, and to the loop motor. The higher frequency components of this voltage are removed by a filter composed of capacitor C132 and inductance L102.

With a 12 volt d-c primary source, certain changes must be made in the power supply to adapt it to operation on the lower voltage. These changes are indicated on the schematic, figure 4-9. As shown, the two primary windings of transformer T105 have been connected in parallel, with the center taps, terminals 5 and 6, connected together and to the ungrounded side of the 12 volt d-c source. Each end of the parallel-connected primaries, terminals 1 and 2, and 4 and 5, is alternately grounded by the vibrator. The tube heaters must also be adapted to 12 volts by connecting each pair of series-connected tubes in parallel with all other pairs.

D. THEORY OF LOOP ANTENNA AND AZIMUTH INDICATOR.

An important property of a loop antenna is that it exhibits marked directional characteristics as far as its signal pick-up ability is concerned, particularly in the vicinity of a minimum, or null point. However, an ambiguity of 180 degrees exists. That is, the loop antenna can indicate that a transmitting station is located, say, along a North-South line from the receiver, but it alone cannot determine whether the station is North or South from the receiver. The sense antenna eliminates this uncertainty.

The loop antenna used in this equipment consists of a total of 21 turns of wire, split and balanced to ground, wound on a phenolic form approximately 5-3/4 inches long by 2-3/8 inches wide by 3/8 inch thick, with a ferrite core. With this arrangement, no additional electrostatic shielding is necessary.

When the motor turns the loop, the indicator synchro transmitter also rotates accordingly, and this shift in position causes the Azimuth Indicator on the instrument panel to assume a corresponding position. This action takes place because, for each position of the synchro transmitter movable winding, or rotor, a different voltage is induced in the fixed windings, or stators, and these voltages are fed by the connecting cable to the stators of the indicator instrument. Since the rotor of the synchro transmitter and that of the indicator are fed from the same voltage source, and the stators are electrically connected together, any change in the voltage across the stators results in a corresponding change in position of the indicator to match that of the synchro transmitter.

E. TROUBLE SHOOTING.

When trouble shooting the Lear Radio Compass, the technician can follow the usual procedures employed when servicing ordinary electronic radio equipment. A thorough study of the block diagram and schematic diagrams should be made in order to gain familiarity with the function of each component in the equipment. One precaution should be noted here:

CAUTION

NEVER OPERATE THE EQUIPMENT WITH THE LOOP MOTOR DISCONNECTED.

Operating the equipment with the loop motor disconnected will destroy the vibrator. This is because of the high surges brought about by changes in impedance appearing at the primary of transformer T105 caused by operating the secondary with a reduced load across it.

The following Trouble Shooting Chart should be of considerable help in isolating the source of malfunction. Before consulting the chart, the technician should obtain all information available regarding the nature of the complaint.

NOTE

In operating the equipment when removed from the aircraft for servicing, testing, or checking, the technician will find it advantageous to use a Bench Test Cable Assembly, Lear Part No. 96551 which is available on order from the factory. This permits rapid inter-connection of units and facilitates testing.

When making a bench test setup, the technician may encounter difficulty with vibrator hash. It may be necessary to resort to extensive filtering and shielding of the power source and amplifier. If possible grounds should be made in the same relative position as in the aircraft. Vibrator hash will cause the loop to rotate in one direction, resulting in errors in COMP measurements. It will also cause the noise level to be excessive, particularly on Band 1.

200 -1750 /0.

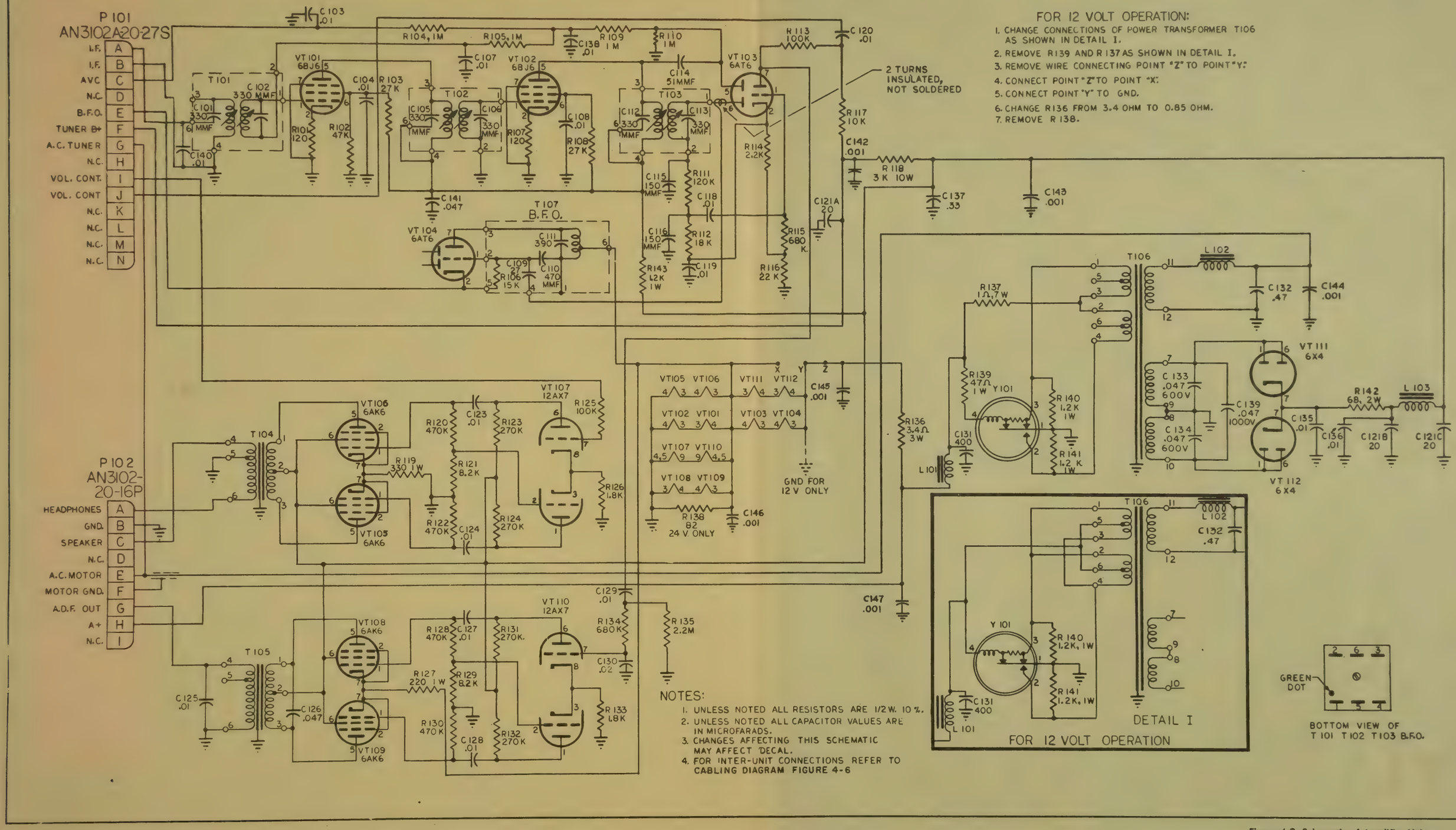
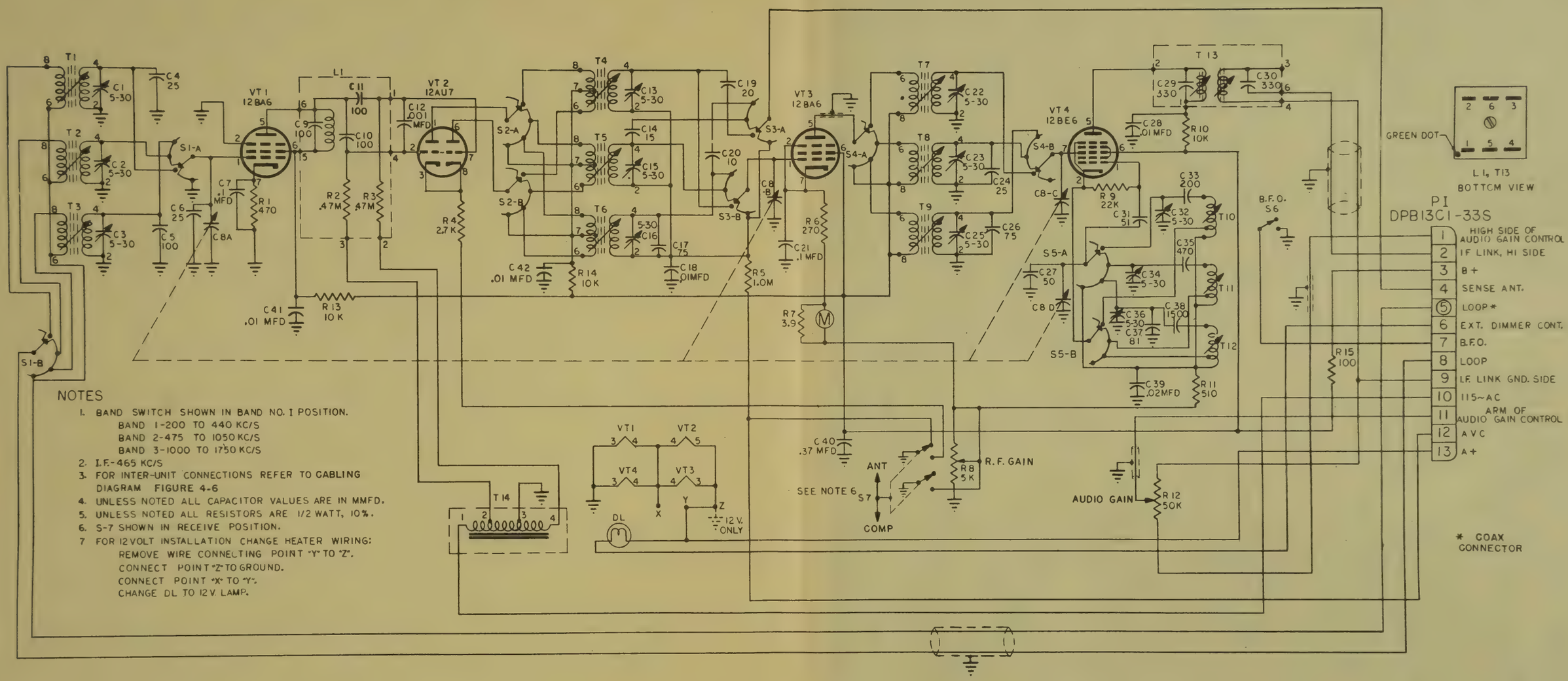


Figure 4-9. Schematic of Amplifier Unit



NOTES

1. BAND SWITCH SHOWN IN BAND NO. 1 POSITION.
   BAND 1-200 TO 440 KC/S
   BAND 2-475 TO 1050 KC/S
   BAND 3-1000 TO 1750 KC/S
2. I.F.-465 KC/S
3. FOR INTER-UNIT CONNECTIONS REFER TO CABLING DIAGRAM FIGURE 4-6
4. UNLESS NOTED ALL CAPACITOR VALUES ARE IN MMFD.
5. UNLESS NOTED ALL RESISTORS ARE 1/2 WATT, 10%.
6. S-7 SHOWN IN RECEIVE POSITION.
7. FOR 12 VOLT INSTALLATION CHANGE HEATER WIRING:
   REMOVE WIRE CONNECTING POINT "Y" TO "Z".
   CONNECT POINT "Z" TO GROUND.
   CONNECT POINT "X" TO "Y".
   CHANGE DL TO 12 V. LAMP.

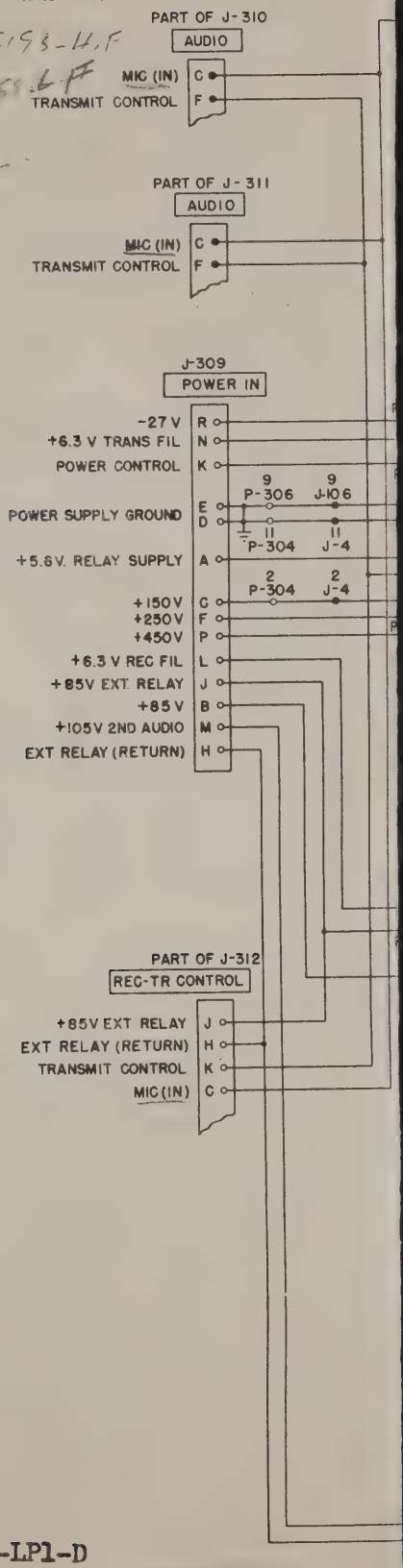
NO. 1-90 R.F. CHASSIS-U.F

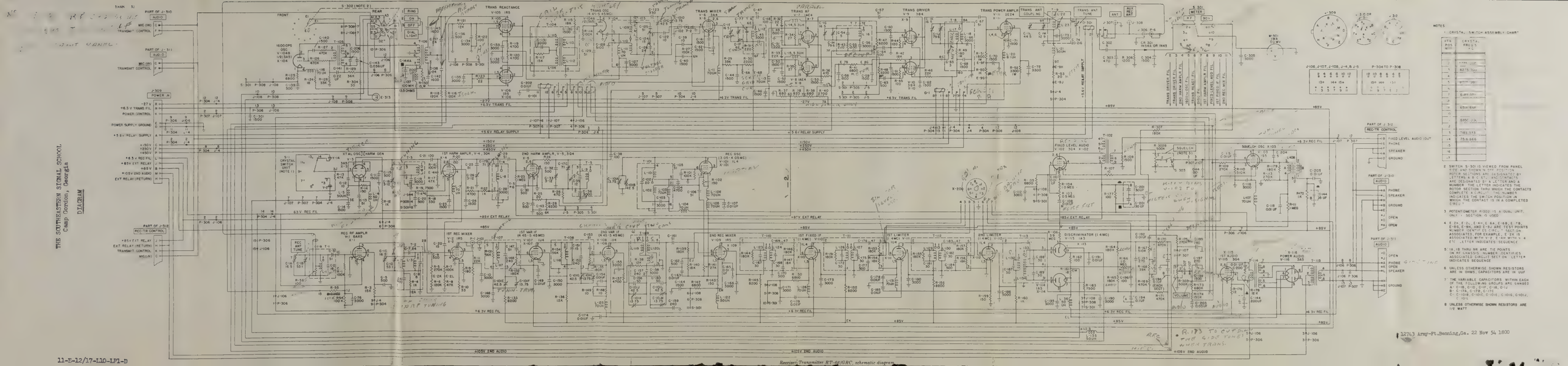
100 - 299. I.F. CHASSIS-L.F

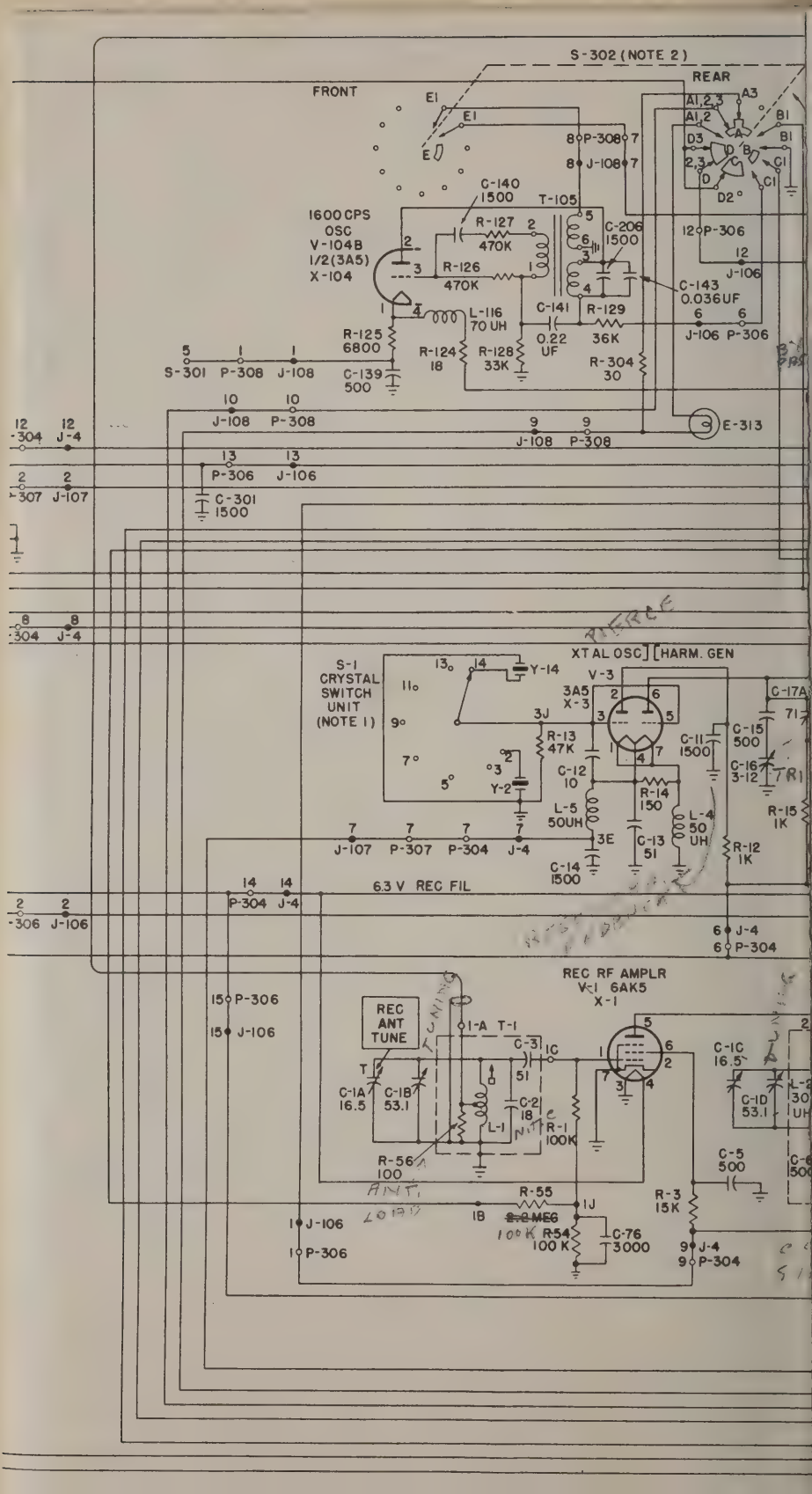
300 - FRONT PANEL

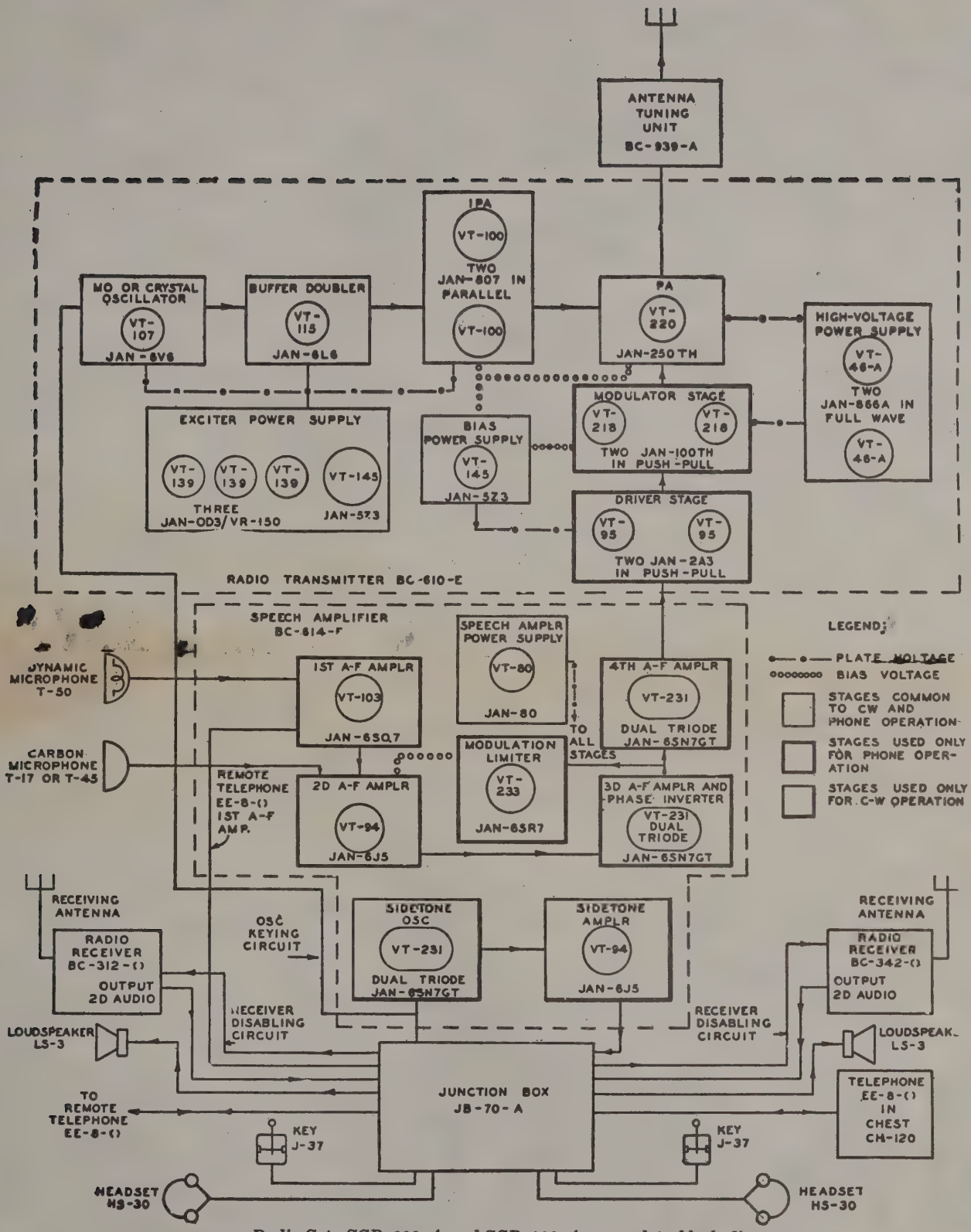
THE SOUTHEASTERN SIGNAL SCHOOL
Camp Gordon, Georgia

DIAGRAM

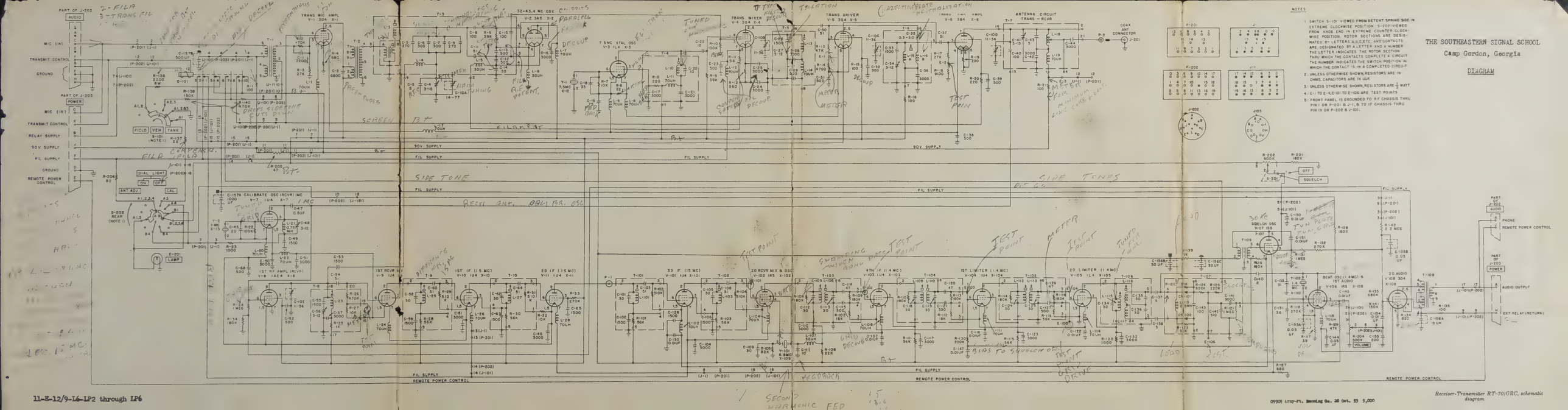


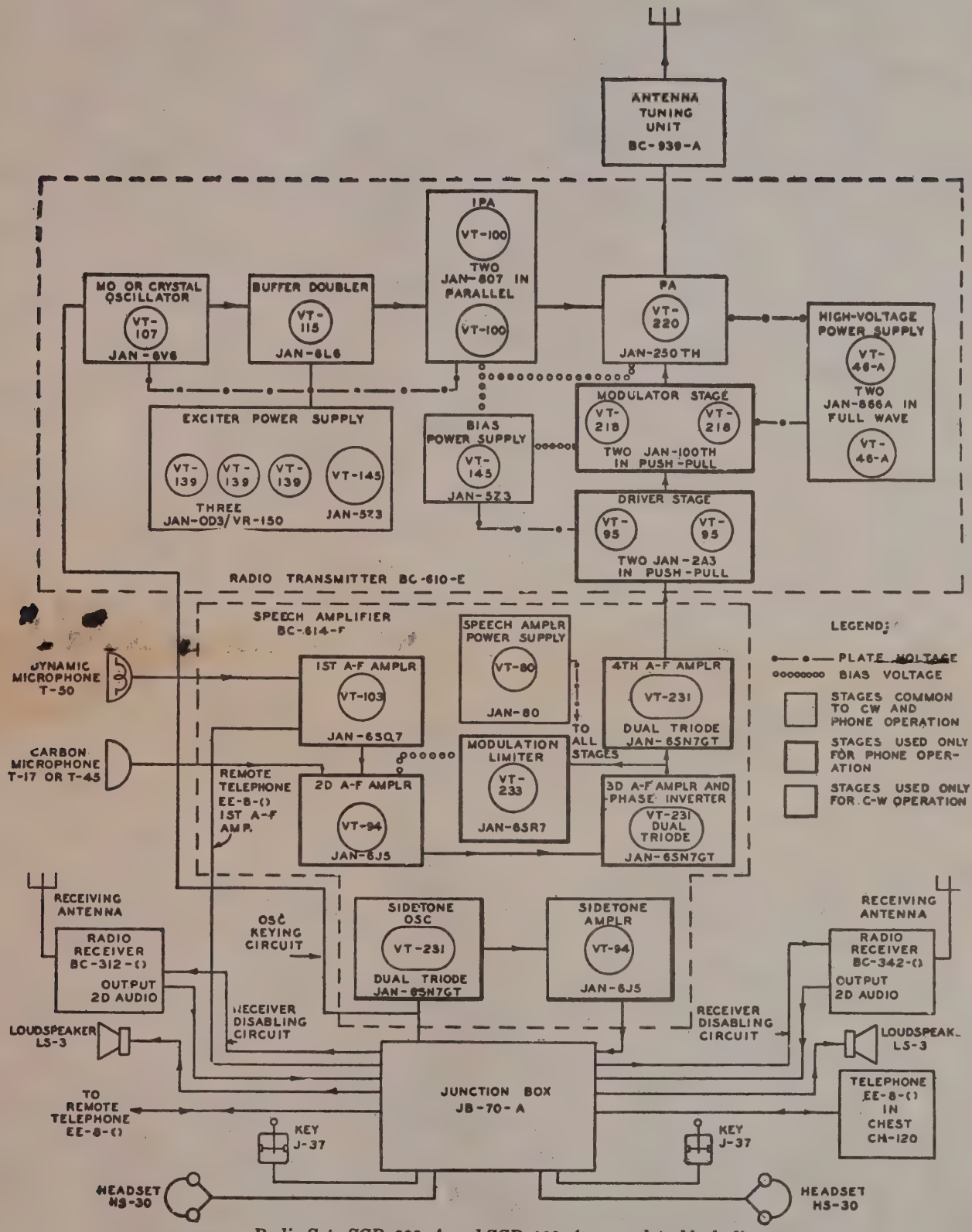
11-E-12/17-L10-LP1-D

THE SIGNAL SCHOOL
Camp Gordon, Georgia
DIAGRAM
11-E-12/17-LIO-LP1-D
12743 Army-Ft.Benning,Ga. 22 Nov 54 1800
Receiver-Transmitter RT-66/GRC, schematic diagram


S-302 (NOTE 2)
FRONT
REAR
E1
E2
E3
A1,2,3
A3
A1,2
B1
D3
D
B
2,3
C1
D2
P-308
J-108
C-140
1500
T-105
1600 CPS
OSC
V-104B
1/2(3A5)
X-104
R-127
470K
R-126
470K
C-206
1500
P-306
J-106
C-143
0.036UF
L-116
70 UH
C-141
0.22
UF
R-129
36K
R-125
6800
R-124
18
R-128
33K
R-304
30
C-139
500
S-301
E-313
C-301
1500
XTAL OSC] [HARM. GEN
S-1
CRYSTAL
SWITCH
UNIT
(NOTE 1)
Y-14
V-3
3A5
X-3
R-13
47K
C-12
10
Y-2
L-5
50UH
C-13
51
L-4
50
UH
C-11
1500
C-15
500
C-16
3-12
C-17A
R-14
150
R-15
1K
R-12
1K
C-14
1500
J-107
P-307
P-304
J-4
63 V REC FIL
REC RF AMPLR
V-1 6AK5
X-1
REC
ANT
TUNE
T-1
C-1A
16.5
C-1B
53.1
C-2
18
C-3
51
L-1
R-1
100K
C-1C
16.5
C-1D
53.1
R-56
100
R-55
R-54
100 K
C-76
3000
C-5
500
R-3
15K

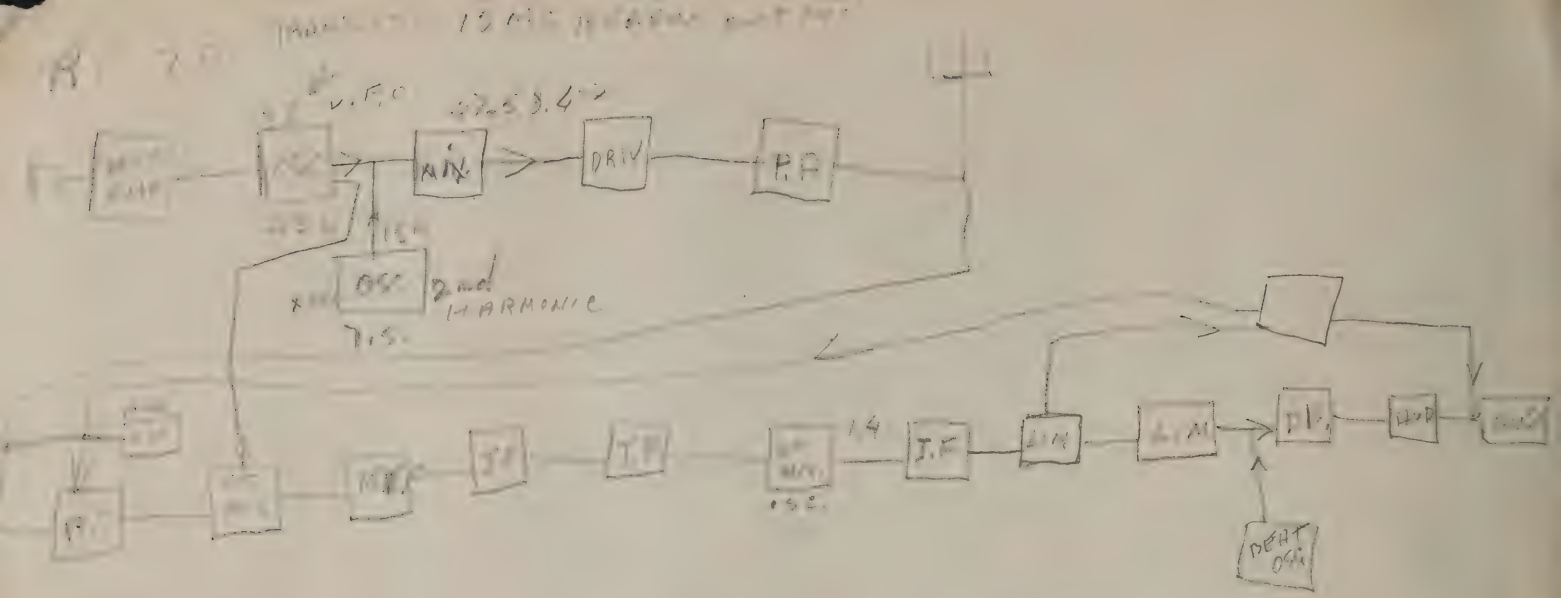


Radio Sets SCR-399-A and SCR-499-A—complete block diagram.


THE SOUTHEASTERN SIGNAL SCHOOL
Camp Gordon, Georgia
DIAGRAM
NOTES
1. SWITCH S-101 VIEWED FROM DETENT SPRING SIDE IN EXTREME CLOCKWISE POSITION. S-202F VIEWED FROM KNOB END IN EXTREME COUNTER CLOCKWISE POSITION. ROTOR SECTIONS ARE DESIGNATED BY LETTERS A,B,C,ETC. AND CONTACTS ARE DESIGNATED BY A LETTER AND A NUMBER THE LETTER INDICATES THE ROTOR SECTION THRU WHICH THE CONTACTS COMPLETE A CIRCUIT THE NUMBER INDICATES THE SWITCH POSITION IN WHICH THE CONTACT IS IN A COMPLETED CIRCUIT
2. UNLESS OTHERWISE SHOWN,RESISTORS ARE IN OHMS. CAPACITORS ARE IN UUF.
3. UNLESS OTHERWISE SHOWN,RESISTORS ARE ½ WATT
4. E-1 TO E-4, E-101 TO E-104 ARE TEST POINTS.
5. FRONT PANEL IS GROUNDED TO RF CHASSIS THRU PIN I ON P-201 & J-1, & TO IF CHASSIS THRU PIN 19 ON P-202 & J-101.
PART OF J-202
AUDIO
MIC (IN)
TRANSMIT CONTROL
GROUND
PART OF J-203
POWER
MIC (IN)
TRANSMIT CONTROL
RELAY SUPPLY
90 V. SUPPLY
FIL SUPPLY
GROUND
REMOTE POWER CONTROL
TRANS MIC AMPL V-1 3A4 X-1
32-43.4 MC OSC V-2 3A5 X-2
TRANS MIXER V-3 3C4 X-3
TRANS DRIVER V-5 3C4 X-5
TRANS PWR AMPL V-6 3B4 X-6
ANTENNA CIRCUIT TRANS - RCVR
COAX ANT CONNECTOR J-201
7.5 MC XTAL OSC V-3 1L4 X-3
7.5MC X-6
TRANS MIC AMPL
SIDE TONE
FIL SUPPLY
90V SUPPLY
REMOTE POWER CONTROL
DIAL LIGHT
ON
OFF
ANT ADJ
CAL
S-202 REAR (NOTE I)
E-201 LAMP
C-157A CALIBRATE OSC (RCVR) 1MC V-7 1U4 X-7
1 MC
1ST RF AMPL (RCVR) V-8 1AE4 X-8
1ST RCVR MIX V-9 1U4 X-9
1ST IF (1.5 MC) V-10 1U4 X-10
2D IF (1.5 MC) V-11 1U4 X-11
3D IF (1.5 MC) V-101 1U4 X-101
2D RCVR MIX & OSC V-102 1R5 X-102
4TH IF (1.4 MC) V-103 1U4 X-103
1ST LIMITER (1.4 MC) V-104 1U4 X-104
2D LIMITER (1.4 MC) V-105 1L4 X-105
BEAT OSC (1.4 MC) & 1ST AUDIO V-106 1R5 X-106
2D AUDIO V-108 3V4 X-108
30 KC SQUELCH OSC V-107 1S5
SQUELCH
VOLUME
PHONE
AUDIO OUTPUT
EXT RELAY (RETURN)
FEEDBACK
SECOND HARMONIC FED
GRID DECOUP
TEST POINT
METER
TUNING
BIAS TO SQUELCH OSC
Receiver-Transmitter RT-70/GRC, schematic diagram.
11-E-12/9-L6-LP2 through LP6
0990I Army-Ft. Benning Ga. 28 Oct. 53 5,000

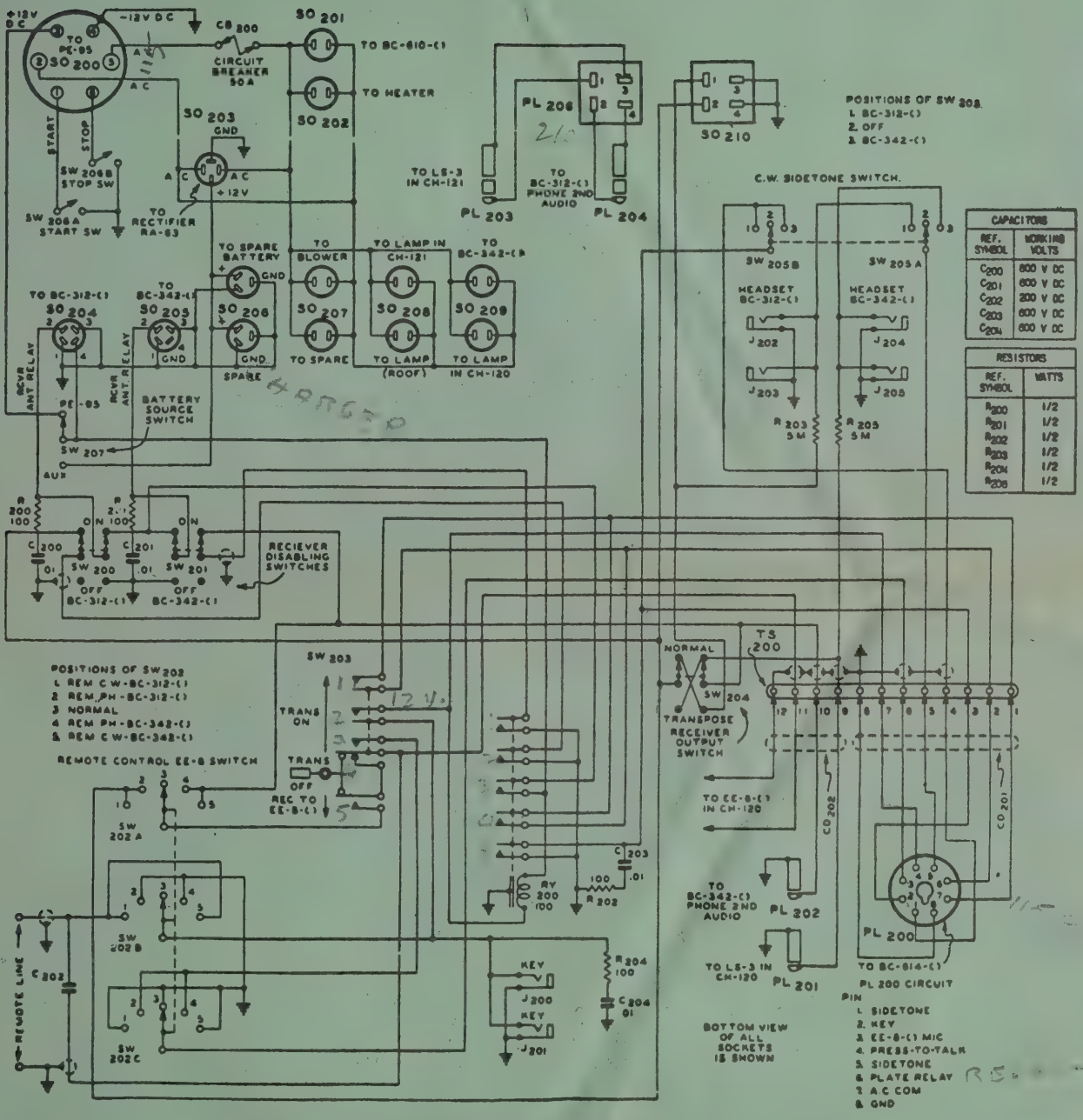


Radio Sets SCR-399-A and SCR-499-A—complete block diagram.


V.F.O
DRIV
P.A
OSC
2nd HARMONIC
T.F.
I.F
DET
OSC.

THE SOUTHEASTERN SIGNAL SCHOOL
Camp Gordon, Georgia

DIAGRAM

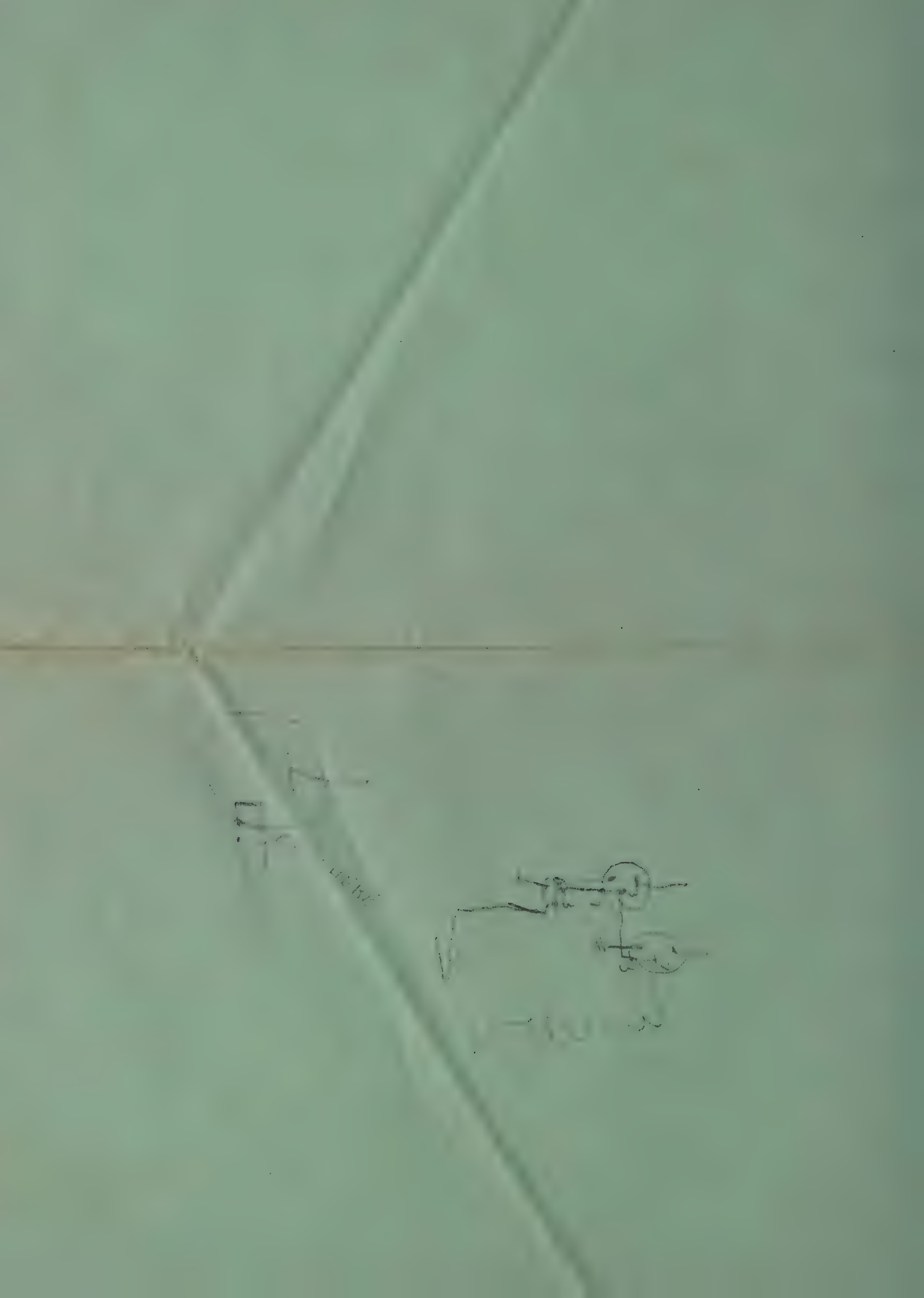


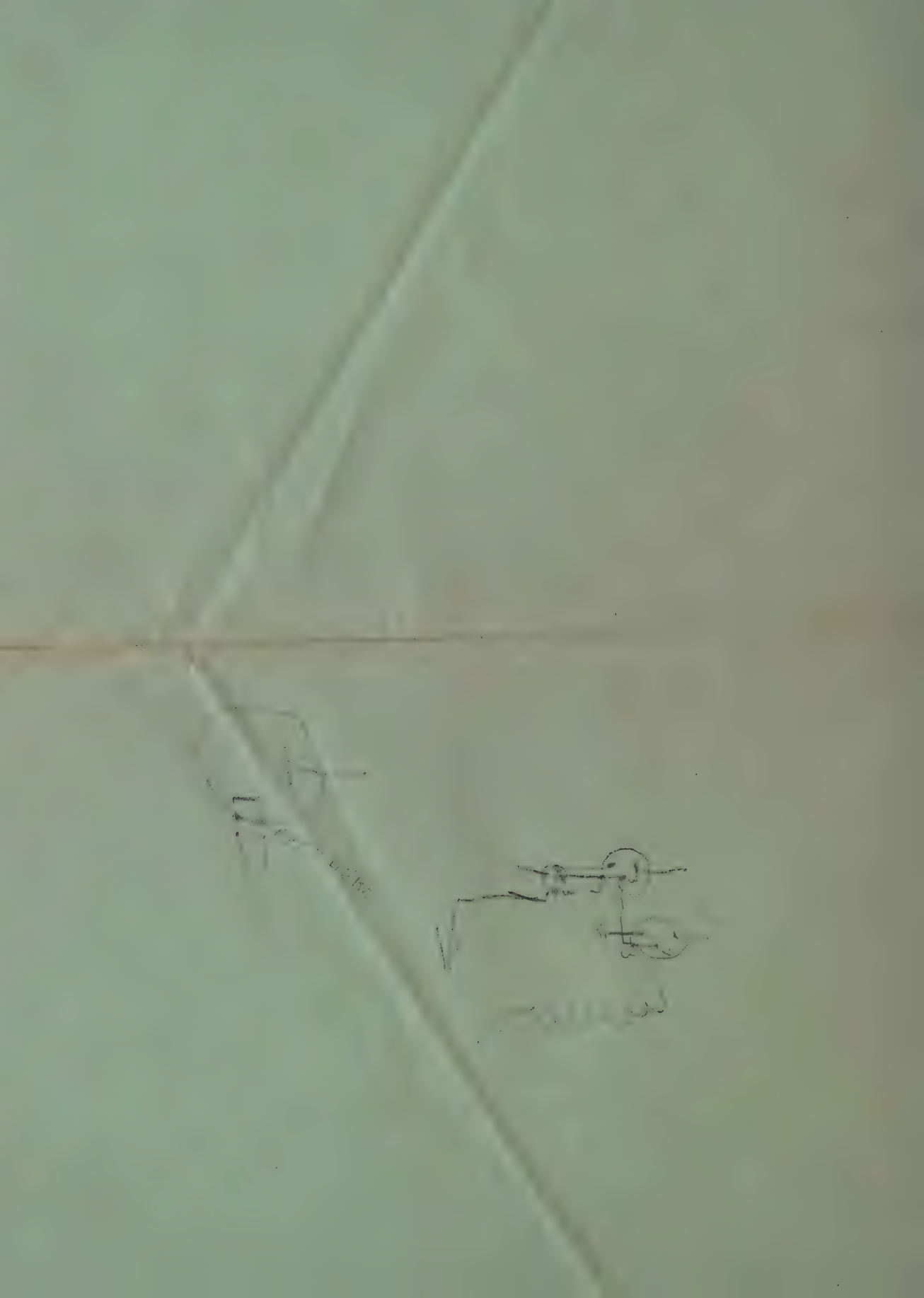
NOTE ALL VALUES ARE IN OHMS OR MICROFARADS UNLESS OTHERWISE INDICATED

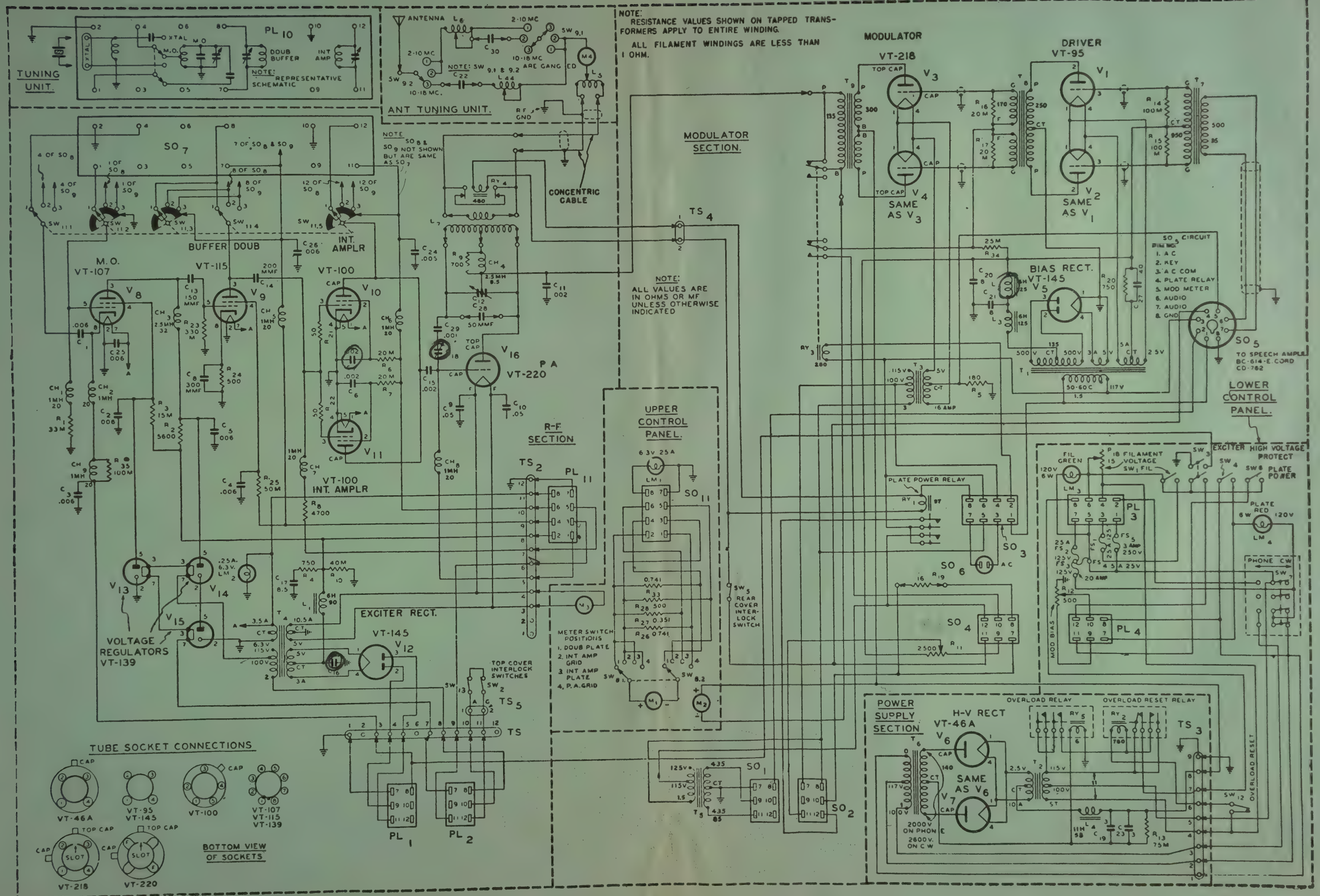
Junction Box JB-70-A—schematic diagram.

RELAY 200 KEYING RELAY

11-E-12/7-L5-LP8-9-D



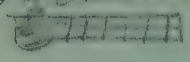




Radio Transmitter BC-610-E—schematic diagram after change in wiring of interlock switches.

A.T. Walker

Receiver



1 to 2.5 mc's

499 – fix.

2 to 5 mc.

1700-2000W. 400w C.W. 300w phone

Mc. – [illegible] for Navy SCR

[illegible] – [illegible]

[illegible] – [illegible]

[illegible] – [illegible]

IPA – Inter PA. – RII 7th Base

PA – [illegible] C18 – RII 7th Base

Mod

ANT. Tuning unit. – couples output to ant.

[illegible] – coax – 7 pin.

(7 pin connector to [illegible])

SCR-584 RECEIVER LABORATORY WORKSHEET

TITLE: General Alignment and Trouble Shooting Procedures for the SCR-584 Receiving System.

Equipments: TS-155B/UP Signal Generator
TS-268/U Crystal Rectifier Test Set
TS-352
TS-117/GP Wave Meter Test Set
TS-28
SCR-584 Receiver Components(Laboratory Arrangement)

INTRODUCTION:

The purpose of this laboratory exercise is to acquaint the student with the location and function of the various receiver circuits, the proper alignment of those circuits, and the locating of troubles that might exist in the circuits.

PROCEDURE:

1. Lab position starting procedure
   A. Make sure all the equipment is plugged into the AC line
   B. Check to see that the following connections exist:
      (1) Local osc (klystron) output cable connected to the signal mixer assembly.
      (2) Signal generator(TS-155) RF jack connected to the signal mixer assembly.
      (3) Signal generator (TS-155)either TRIGGER jack connected to TRIGGER IN jack on synchroscope(TS-28)
      (4) Remote video amplifier jack J102 (output of receiver video channel) connected to the signal IN jack of synchroscope
   C. Turn on all the equipment and check that pilot lights are glowing. If they are not, do the following in order: check that the unit is plugged in, check the fuses, check the pilot lamps. If none of these are faulty, call the instructor.
   D. Allow the equipment to warm up for five minutes(if minutes is a half-hour in the field) and then proceed.

2. Equipment control settings
   A. Adjust the local oscillator(klystron) REFLECTOR VOLTS and fine tuning knob slightly to obtain a crystal current meter reading of between 0.4 and 0.5 ma. If the crystal current is above this limit, reduce the local oscillator-to-crystal coupling by turning the thumbscrew on the mixer assembly. If crystal current cannot be obtained, call the instructor.
   B. Synchroscope(TS-28) control settings
      (1) VIDEO GAIN at 1.
      (2) FAST SWEEP ADJUST. at extreme counter-clockwise position
      (3) Sweep selector at 25.
      (4) TRIGGER SELECTOR at EXT(- or +)
      (5) CALIBRATION MARKS at OFF.
      (6) VERTICAL CENTERING adjusted to place the sweep trace

PATTERSON

SCR-584 RECEIVER LABORATORY WORKSHEET

SCR-584 Receiving System.

Equipments: TS-155B/UP Signal Generator
TS-268/U Crystal Rectifier Test Set
TS-352
TS-117/GP Wave Meter Test Set
TS-28
SCR-584 Receiver Components(Laboratory Arrangement)

INTRODUCTION:

The purpose of this laboratory exercise is to acquaint the student with the location and function of the various receiver circuits, the proper alignment of those circuits, and the locating of troubles that might exist in the circuits.

PROCEDURE:

1. Lab position starting procedure
   A. Make sure all the equipment is plugged into the AC line
   B. Check to see that the following connections exist:
      (1) Local osc.(klystron) output cable connected to the signal mixer assembly.
      (2) Signal generator(TS-155) RF jack connected to the signal mixer assembly.
      (3) Signal generator (TS-155)either TRIGGER jack connected to TRIGGER IN jack on synchroscope(TS-28)
      (4) Remote video amplifier jack 1102 (output of receiver range channel) connected to the signal IN jack of synchroscope.
   C. Turn on all the equipment and check that pilot lights are glowing. If they are not, do the following in order:check that the unit is plugged in; check the fuses; check the pilot lamps; if none of these are faulty, call the instructor.
   D. Allow the equipment to warm up for five minutes (preferably a half-hour in the field) and then proceed.

2. Equipment control settings
   A. Adjust the local oscillator(klystron) REFLECTOR VOLTS and FINE tuning knob slightly to obtain a crystal current meter reading of between 0.15 and 0.5 ma. If the crystal current is above this limit, reduce the local oscillator-to-crystal coupling by turning the thumbscrew on the wave guide. If crystal current cannot be obtained, call the instructor.
   B. Synchroscope(TS-28) control settings
      (1) VIDEO GAIN at 1.
      (2) FAST SWEEP ADJUST. at extreme counter-clockwise position
      (3) Sweep selector at 25.
      (4) TRIGGER SELECTOR at EXT(- or +)
      (5) CALIBRATION MARKS at OFF.

(7) HORIZONTAL CENTERING adjusted to place the start of the sweep at the extreme left edge of the scope screen.
(8) INTENSITY and FOCUS adjusted as required for a clear presentation.

Set the signal generator (TS-155) or pluring CAL/D unit to middle position and RF OSC switch to the left, zeroing the needle on the POWER MONITOR meter. Next place the RF OSC switch to the ON position and adjust RF OSC OUTPUT knob until the meter reads full scale (200). Place CAL/D knob on INT DUIO position. Now set the rest of the controls as follows:

(1) OUTPUT TRIGGER FREQ. at 2K
(2) PULSE WIDTH at 1.
(3) RF ATTENUATOR at 40
(4) COARSE PULSE DELAY at 0
(5) FINE PULSE DELAY from one-quarter to one-half turn clockwise
(6) RF TUNING is turned slowly until a video pulse appears on the scope
(7) Identify pulse by moving PULSE DELAY controls. Pulse should move along sweep base line.

Receiver alignment procedure (This procedure will be followed during the receiver lab set-up. The receiver alignment in the van will be accomplished in accordance with instructions set forth in Chapter 5, TM 11-1524. A separate procedure is needed because of the lack of a transmitter in the lab set-up.)

A. Preliminary alignment
(1) Turn the local osc.-to-mixer coupling adjustment counter-clockwise until it is approximately three-quarters of the way out. This will protect the crystal.
(2) Set the REFLECTOR VOLTS control (R1822) to 10.
(3) Connect the milliameter between jacks J1805(+) and J1805(-) on the front panel of the oscillator unit.
(4) Turn the GRID VOLTS CONTROL (R817) in a clockwise direction until the milliammeter reads about 15 ma.
(5) Connect the voltmeter between pin#5 of V1805 and the cathode of the klystron (V1803). Adjust the COMP. VOLTS CONTROL until the meter reads zero (0).
(6) Connect the milliammeter between J1805 and J1806, using the 50 milliamp range.
(7) Adjust the REFLECTOR VOLTS CONTROL until the klystron oscillates. This is indicated by a sudden maximum current reading on the crystal current meter M701.
(8) Readjust the GRID VOLTS CONTROL for a reading of 30 milliamps.
(9) Readjust the REFLECTOR VOLTS CONTROL for a maximum reading on the crystal current meter. In some cases, two values of voltage will give a maximum crystal current reading. In this case, set the REFLECTOR VOLTS CONTROL at the point of highest voltage.

B. Tuning the local oscillator(klystron)
(1) Normally, the proper tuning of the klystron is accomplished by setting the gride spacing of the klystron by varying the COARSE and FINE tuning knob and then varying the reflector voltage control, so that the klystron is oscillating as in the preceding

the transmitter frequency. In the absence of the fixed frequency of the magnatron, the klystron will be tuned to the set frequency of 2800 mc as directed in (2), (3), and (4) of 3.B.

(2) Turn the FINE and COARSE frequency controls through the entire range of their travels, always maintaining maximum [illegible] current meter by varying the setting of the reflector volts [illegible] of oscillating over its full range.

(3) [illegible] the output of the klystron by connecting a wavemeter, TS-217, to monitor jack J1804, on the front panel of the oscillator unit. Vary the micrometer knob until the meter of the wavemeter is peaked, or reads a maximum. Record the reading and apply this figure to the chart on the back of the test set. Then determine the frequency at which the klystron is operating (Note: If the klystron is operating above the desired frequency, the grid spacing should be varied by rotating the COURSE and FINE knobs COUNTERCLOCKWISE. If below, rotate controls CLOCKWISE. ALWAYS REMEMBER TO READJUST THE REFLECTOR VOLTS CONTROL FOR A MAXIMUM CRYSTAL CURRENT READING AFTER ANY CHANGE IN GRID SPACING. Set frequency for 2800 mc.

(4) When the klystron has been set for a frequency of 2800 mc, and the reflector volts control set for a maximum crystal current reading, the klystron-to-mixer adjustment should be varied so the crystal current reading is between 0.15 and 0.5 ma. For purposes of uniformity, a crystal current reading of 0.3 ma is desired.

C. Adjustment of the voltage regulator circuit. The purpose of this circuit is to develop a regulated 120 volts which is used in various circuits in the receiver. Proper alignment is as follows:

(1) Remove V702.

(2) Connect voltmeter between pin #6 of V702 and ground.

(3) Adjust the VOLTAGE REGULATOR ADJUST R 727 for a reading of 120 volts.

[illegible] circuit is to control the amplitude of the received signal which is being applied to the Automatic Tracking Circuits. For weak signals, maximum gain of the IF strip is desired (therefore AGC output should be zero(0). However, should the receiver signal output exceed a pre-determined value, this AGC circuit will develop a negative voltage which will be applied to the grids of the first and second IF amplifiers, decreasing overall gain of the IF strip and thus reducing the signal amplitude being applied to the Auto. Track. ckts. Adjust as follows:

(1) Remove V702.

(2) Turn the AGC-OFF switch to OFF (In the van, turn S1751 to MANUAL)

(3) Set VOLUME CONTROL to MAXIMUM (located below crystal [illegible])

(4) Connect voltmeter between pin #6 of V702 and ground.

(5) Adjust AGC ADJUST control to give zero (0) reading on voltmeter.

PATTERSON

LABORATORY ADJUSTMENTS OF THE SCR - 584

I RANGE SYSTEM (TM 11-524, Chapter 16)

1. VOLTAGE ADJUSTMENT

a. Adjust line voltage to 115 volts a-c.

b. The range unit should be allowed to warm up at least 20 minutes before attempting adjustments.

c. Check the voltage between J619 on the range unit chassis and ground. It should be +250 volts d-c. The adjustment is made by the VOLTAGE ADJUST control on the range power supply chassis.

2. 2000 YARD SWEEP

a. PREPARATION

(1) Turn NARROW GATE WIDTH and WIDE GATE WIDTH controls to a minimum (counter-clockwise). This removes the gating voltages from both scopes.

(2) Adjust INTENSITY and FOCUS controls of both scopes for a sharp picture.

b. OSCILLATOR TUNING

(1) Adjust OSCILLATOR TUNING control until the sweep on the 2000 yard scope is expanded to maximum. (It may be necessary to reduce the diameter control to keep the picture on the scope).

(2) This control seldom needs changing after once being set correctly.

c. DIAMETER

(1) Adjust the DIAMETER control for a picture about 2 inches in diameter.

(2) This control may have to be changed from time to time as the other controls are adjusted.

(3) Final setting will be made to give a sweep trace just a little larger than the inner reference circle etched on the range dial

d. CENTERING

(1) Adjust the CENTERING controls to position the sweep in the center of the scope.

e. PHASE and BALANCE

(1) Adjust the PHASE and BALANCE controls to keep the sweep circular.

(2) Since the two controls interact, they must be adjusted alternately.

(3) The reference circles etched in the range dial may be used to judge the circularity of the sweep.

3. MULTIVIBRATORS

a. PREPARATION

Place the TEST-VIDEO switch on the range indicator unit in "TEST" position. With a test lead in the TEST-VIDEO jack, waveforms at any test jack in the range unit may be observed on the range scopes.

b. 20 KC MULTIVIBRATOR

(1) Put test prod in J612 on the range chassis.

(2) Adjust the 20 KC MV until a pattern of four sweeps appears on the 2000 yard scope. This is illustrated below (same as waveform "B" on page 190 of the SCR-584 Service Manual TM 11-1524).

B

(3) A stationary pattern will be obtained over a fairly wide range of adjustment of the control. Note the limits of this range and set the 20 KC MV control in the middle.

c. 5 KC MULTIVIBRATOR

(1) With the test prod still in J612, adjust the 5 KC MV control until a pattern of four humps appears on the

32,000 yard scope. (This is the same waveform as "C" on page 190). Here again, the correct setting is half-way between the two points where the pattern fails to remain stable.

C

(2) If the range unit is badly misadjusted, it may be necessary to adjust the 32,000 yard phase, balance and diameter controls before a readable picture can be obtained.

(3) Be sure the picture shows just a single trace and not a double one.

(4) Note the two positive trigger pips on each hump in the figure (positive pips pointing inward). The presence of these two pips indicate that the 20 kc multivibrator is operating in proper mode. If only one pip is present on each hump, a slight readjustment of the 20 kc multivibrator will correct the condition.

(5) When the above settings of the 20 kc and the 5 kc multivibrators are correct, the following waveform will be obtained from J613. This waveform is "D", page 190, and is obtained on the 32,000 yard scope.

D

(6) Occasionally the above waveform on J613 may be fuzzy or jittery. If a slight readjustment of the 5 kc multivibrator does not correct this, proceed to the 1.7 kc multivibrator adjustment for it may be interacting with the 5 kc multivibrator.

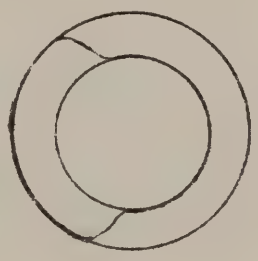
d. 1.7 KC MULTIVIBRATOR

(1) Using J614, adjust the 1.7 KC MV until a stable pattern of 3 sweeps, as shown below, appears on the 32,000 yard scope (Figure "E", page 190).

E

(2) When the 1.7 kc multivibrator is correctly adjusted, the following waveform should be obtained at J615, (Fig "F", page 190). The correct adjustment is in the middle of the stable range.

(3) This is the waveform from the 1.7 kc clipper, so that adjustment of the 1.7 kc multivibrator will affect both waveforms obtained from J614 and J615.



F

e. If the frequency dividing circuits were badly misadjusted, it will be necessary to check each adjustment again, since the three multivibrators interact to some degree. Check for a stable waveform at all jacks, 615, 614, 613, and 612. If any circuit appears unstable, a slight touch-up of the adjustment is all that should be required.

NOTE: The waveform obtained at J613 (Figure "D", page 190) often will be affected by a slight misadjustment of the 1.7 kc as well as the 5 kc multivibrators.

4. 32,000 YARD SWEEP

a. Adjust DIAMETER, CENTERING, PHASE and BALANCE controls for a centered circular picture.

b. If it is found that the range scope pictures cannot be made

circular, and it is known that something has happened to throw out the adjustment of the sweep transformers, refer to TM 11-1524 for their adjustment.

5. OTHER ADJUSTMENTS

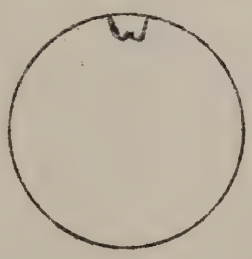
a. TRIGGER DELAY

(1) Turn the TRIGGER DELAY control to minimum (counter-clockwise).

(2) With the test lead in J620, turn up the TRIGGER DELAY control until the second trigger appears on the 32,000 yard scope. See figure below (same as Figure "Q" on page 190).

Q

(3) Using J623, readjust <u>slightly</u> the TRIGGER DELAY control until the small pip riding within the gate shown below appears in the center of the gate. This is the correct adjustment of the trigger delay (correct coincidence of the trigger gate and the 82 kc sine wave in the trigger selector stage). This illustration is "P" on page 190.



P

(4) Now place the test lead back in J620. If the second pip does not fall under the zero calibration of the 32,000 yard scope, it may be necessary to loosen the cathode ray tube and rotate it slightly. (For final adjustment of the cathode ray tube position, the leading edge of the transmitted pulse should be used instead of the trigger from J620).

b. WIDE GATE WIDTH

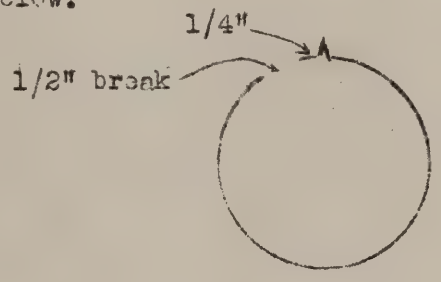
(1) Turn INTENSITY down until the picture just blanks out on the 32,000 yard scope.

(2) Turn WIDE GATE WIDTH control clockwise until the end of the wide gate is separated from the beginning by about 1/2 inch. See figure below.

c. WIDE GATE DELAY

(1) The transmitting and receiving systems should be on for this adjustment. (When working with the range unit alone, the position of the transmitter pulse is closely approximated by the position of the trigger obtained at J620).

(2) Adjust the WIDE GATE DELAY so that the start of the wide gate occurs 1/4 inch before the transmitter pulse. This is shown below.



d. NARROW GATE WIDTH

(1) Turn NARROW GATE WIDTH control up until a gate of approximately 1400 yards is obtained on the 2000 yard scope.

(2) Adjust INTENSITY until the ungated sweep just appears superimposed on the narrow gate, then turn down the intensity until only the narrow gate remains. Readjust the narrow gate width for 1400 yards.

e. NARROW GATE DELAY

(1) The narrow gate delay is properly adjusted when the narrow gate (obtained from J625) tracks the 32,000 yard hairline from zero range to 32,000 yards.

(2) If the range unit has been modified by addition of R1679A, it should be set in the middle of its range and not used in the succeeding steps.

(3) Set the 32,000 yard range hairline on 4000 yards.

(4) Adjust R634 (the NARROW GATE DELAY control on the front panel) until the narrow gate is centered around the range hairline on the 32,000 yard scope. This is shown in figure "A" below.

A

B

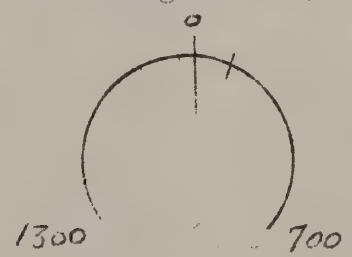
(5) Set the 32,000 yard range hairline on 28,000 yards.

(6) Adjust R636 (the NARROW GATE DELAY control on the rear top of the range chassis) until the narrow gate is again centered around the 32,000 yard range hairline as shown in figure "B" above.

(7) Repeat steps 3 through 6 until the narrow gate tracks the 32,000 yard range hairline smoothly throughout the entire range of zero to 32,000 yards. (On some sets it might be necessary to sacrifice perfect adjustment below 2000 yards to insure smooth tracking through the majority of the range).

(8) The final check for correct tracking, of course, is to throw the TEST-VIDEO switch to VIDEO and observe the 2000 yard hairline to see that it remains on the 1400 yard narrow gate throughout the tracking range. If not, slight readjustment of R634 and R636 will be in order. NOTE: Do not vary these controls enough to rotate the narrow gate through a full 2000 yards..

(9) The position of the narrow gate hairline is indicated below.



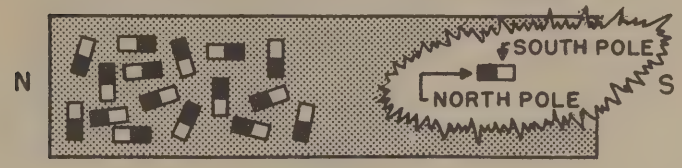
NOTE: When operating the SCR-584, occasionally the position of R634, the narrow gate control on the front panel, will become misadjusted due to accidental bumping of the control. When this occurs, turn the range hairlines back into the main bang, and adjust R634 until the main bang shows on the 2000 yard scope. Adjustment of R636 on the top rear of the chassis is not necessary since the tracking between R636 and R634 has not been altered.

THE SOUTHEASTERN SIGNAL SCHOOL
Camp Gordon, Georgia

INFORMATION SHEET

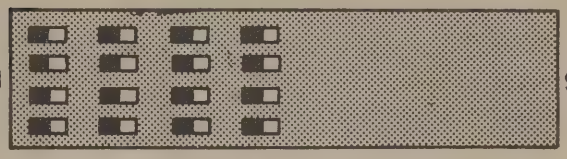
NATURAL AND ARTIFICIAL MAGNETISM

Unmagnetized molecules are jumbled.



Magnetized molecules are lined up.

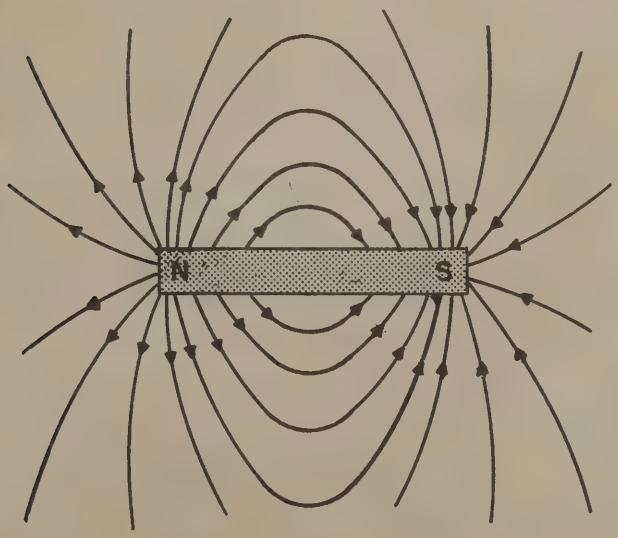
All north poles face one way



All south poles face other way

Every magnet has at least one north and one south pole.
Break magnet - still have north and south poles.

Pattern of lines of force about a bar magnet.



END

Army Ft McPherson Ga 297/54

$X_L = 2\pi FL$

$I = \frac{X_L}{2\pi FL}$

$\sqrt{40.0710}$

$\sqrt{2\,4.4\,5\,5\,5,43.2176}$

$\sqrt{40.0710}$

$123 \mid 0401$

$128 \mid 01110$

$\sqrt{8571}$

$\sqrt{10000}$

$\sqrt{1.0000}$

$\sqrt{64}$

$\sqrt{36}$

$\sqrt{100}$

$\sqrt{144}$

$\sqrt{1444}$

$\sqrt{14884}$

$\sqrt{144225}$

$\sqrt{1024}$

$\sqrt{1225}$

$\sqrt{1369}$

$\sqrt{1521}$

$\sqrt{1681}$

$\sqrt{1849}$

$\sqrt{2025}$

$\sqrt{2209}$

$\sqrt{2401}$

$\sqrt{2601}$

$\sqrt{2809}$

$\sqrt{3025}$

$\sqrt{3249}$

$\sqrt{3481}$

$\sqrt{3721}$

$\sqrt{3969}$

$\sqrt{4225}$

$\sqrt{4489}$

$\sqrt{4761}$

$\sqrt{5041}$

$\sqrt{5329}$

$\sqrt{5625}$

$\sqrt{5929}$

$\sqrt{6241}$

$\sqrt{6561}$

$\sqrt{6889}$

$\sqrt{7225}$

$\sqrt{7569}$

$\sqrt{7921}$

$\sqrt{8281}$

$\sqrt{8649}$

$\sqrt{9025}$

$\sqrt{9409}$

$\sqrt{9801}$

$\sqrt{10201}$

$\sqrt{10609}$

$\sqrt{11025}$

$\sqrt{11449}$

$\sqrt{11881}$

$\sqrt{12321}$

$\sqrt{12769}$

$\sqrt{13225}$

$\sqrt{13689}$

$\sqrt{14161}$

$\sqrt{14641}$

$\sqrt{15129}$

$\sqrt{15625}$

$\sqrt{16129}$

$\sqrt{16641}$

$\sqrt{17161}$

$\sqrt{17689}$

$\sqrt{18225}$

$\sqrt{18769}$

$\sqrt{19321}$

$\sqrt{19881}$

$\sqrt{20449}$

$\sqrt{21025}$

$\sqrt{21609}$

$\sqrt{22201}$

$\sqrt{22801}$

$\sqrt{23409}$

$\sqrt{24025}$

$\sqrt{24649}$

$\sqrt{25281}$

$\sqrt{25921}$

$\sqrt{26569}$

$\sqrt{27225}$

$\sqrt{27889}$

$\sqrt{28561}$

$\sqrt{29241}$

$\sqrt{29929}$

$\sqrt{30625}$

$\sqrt{31329}$

$\sqrt{32041}$

$\sqrt{32761}$

$\sqrt{33489}$

$\sqrt{34225}$

$\sqrt{34969}$

$\sqrt{35721}$

$\sqrt{36481}$

$\sqrt{37249}$

$\sqrt{38025}$

$\sqrt{38809}$

$\sqrt{39601}$

$\sqrt{40401}$

$\sqrt{41209}$

$\sqrt{42025}$

$\sqrt{42849}$

$\sqrt{43681}$

$\sqrt{44521}$

$\sqrt{45369}$

$\sqrt{46225}$

$\sqrt{47089}$

$\sqrt{47961}$

$\sqrt{48841}$

$\sqrt{49729}$

$\sqrt{50625}$

$\sqrt{51529}$

$\sqrt{52441}$

$\sqrt{53361}$

$\sqrt{54289}$

$\sqrt{55225}$

$\sqrt{56169}$

$\sqrt{57121}$

$\sqrt{58081}$

$\sqrt{59049}$

$\sqrt{60025}$

$\sqrt{61009}$

$\sqrt{62001}$

$\sqrt{63001}$

$\sqrt{64009}$

$\sqrt{65025}$

$\sqrt{66049}$

$\sqrt{67081}$

$\sqrt{68121}$

$\sqrt{69169}$

$\sqrt{70225}$

$\sqrt{71289}$

$\sqrt{72361}$

$\sqrt{73441}$

$\sqrt{74529}$

$\sqrt{75625}$

$\sqrt{76729}$

$\sqrt{77841}$

$\sqrt{78961}$

$\sqrt{80089}$

$\sqrt{81225}$

$\sqrt{82369}$

$\sqrt{83521}$

$\sqrt{84681}$

$\sqrt{85849}$

$\sqrt{87025}$

$\sqrt{88209}$

$\sqrt{89401}$

$\sqrt{90601}$

$\sqrt{91809}$

$\sqrt{93025}$

$\sqrt{94249}$

$\sqrt{95481}$

$\sqrt{96721}$

$\sqrt{97969}$

$\sqrt{99225}$

$\sqrt{100489}$

$\sqrt{101761}$

$\sqrt{103041}$

$\sqrt{104329}$

$\sqrt{105625}$

$\sqrt{106929}$

$\sqrt{108241}$

$\sqrt{109561}$

$\sqrt{110889}$

$\sqrt{112225}$

$\sqrt{113569}$

$\sqrt{114921}$

$\sqrt{116281}$

$\sqrt{117649}$

$\sqrt{119025}$

$\sqrt{120409}$

$\sqrt{121801}$

$\sqrt{123201}$

$\sqrt{124609}$

$\sqrt{126025}$

$\sqrt{127449}$

$\sqrt{128881}$

$\sqrt{130321}$

$\sqrt{131769}$

$\sqrt{133225}$

$\sqrt{134689}$

$\sqrt{136161}$

$\sqrt{137641}$

$\sqrt{139129}$

$\sqrt{140625}$

$\sqrt{142129}$

$\sqrt{143641}$

$\sqrt{145161}$

$\sqrt{146689}$

$\sqrt{148225}$

$\sqrt{149769}$

$\sqrt{151321}$

$\sqrt{152881}$

$\sqrt{154449}$

$\sqrt{156025}$

$\sqrt{157609}$

$\sqrt{159201}$

$\sqrt{160801}$

$\sqrt{162409}$

$\sqrt{164025}$

$\sqrt{165649}$

$\sqrt{167281}$

$\sqrt{168921}$

$\sqrt{170569}$

$\sqrt{172225}$

$\sqrt{173889}$

$\sqrt{175561}$

$\sqrt{177241}$

$\sqrt{178929}$

$\sqrt{180625}$

$\sqrt{182329}$

$\sqrt{184041}$

$\sqrt{185761}$

$\sqrt{187489}$

$\sqrt{189225}$

$\sqrt{190969}$

$\sqrt{192721}$

$\sqrt{194481}$

$\sqrt{196249}$

$\sqrt{198025}$

$\sqrt{199809}$

$\sqrt{201601}$

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$\sqrt{5276209}$

$\sqrt{5285401}$

$\sqrt{5294601}$

$\sqrt{5303809}$

$\sqrt{5313025}$

$\sqrt{5322249}$

$\sqrt{5331481}$

$\sqrt{5340721}$

$\sqrt{5349969}$

$\sqrt{5359225}$

$\sqrt{5368489}$

$\sqrt{5377761}$

$\sqrt{5387041}$

$\sqrt{5396329}$

$\sqrt{5405625}$

$\sqrt{5414929}$

$\sqrt{5424241}$

$\sqrt{5433561}$

$\sqrt{5442889}$

$\sqrt{5452225}$

$\sqrt{5461569}$

$\sqrt{5470921}$

$\sqrt{5480281}$

$\sqrt{5489649}$

$\sqrt{5499025}$

$\sqrt{5508409}$

$\sqrt{5517801}$

$\sqrt{5527201}$

$\sqrt{5536609}$

$\sqrt{5546025}$

$\sqrt{5555449}$

$\sqrt{5564881}$

$\sqrt{5574321}$

$\sqrt{5583769}$

$\sqrt{5593225}$

$\sqrt{5602689}$

$\sqrt{5612161}$

$\sqrt{5621641}$

$\sqrt{5631129}$

$\sqrt{5640625}$

$\sqrt{5650129}$

$\sqrt{5659641}$

$\sqrt{5669161}$

$\sqrt{5678689}$

$\sqrt{5688225}$

$\sqrt{5697769}$

$\sqrt{5707321}$

$\sqrt{5716881}$

$\sqrt{5726449}$

$\sqrt{5736025}$

$\sqrt{5745609}$

$\sqrt{5755201}$

$\sqrt{5764801}$

$\sqrt{5774409}$

$\sqrt{5784025}$

$\sqrt{5793649}$

$\sqrt{5803281}$

$\sqrt{5812921}$

$\sqrt{5822569}$

$\sqrt{5832225}$

$\sqrt{5841889}$

$\sqrt{5851561}$

$\sqrt{5861241}$

$\sqrt{5870929}$

$\sqrt{5880625}$

$\sqrt{5890329}$

$\sqrt{5900041}$

$\sqrt{5909761}$

$\sqrt{5919489}$

$\sqrt{5929225}$

$\sqrt{5938969}$

$\sqrt{5948721}$

$\sqrt{5958481}$

$\sqrt{5968249}$

$\sqrt{5978025}$

$\sqrt{5987809}$

$\sqrt{5997601}$

$\sqrt{6007401}$

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$\sqrt{6027025}$

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$\sqrt{6046681}$

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$\sqrt{6066369}$

$\sqrt{6076225}$

$\sqrt{6086089}$

$\sqrt{6095961}$

$\sqrt{6105841}$

$\sqrt{6115729}$

$\sqrt{6125625}$

$\sqrt{6135529}$

$\sqrt{6145441}$

$\sqrt{6155361}$

$\sqrt{6165289}$

$\sqrt{6175225}$

$\sqrt{6185169}$

$\sqrt{6195121}$

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$\sqrt{6215049}$

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$\sqrt{6285049}$

$\sqrt{6295081}$

$\sqrt{6305121}$

$\sqrt{6315169}$

$\sqrt{6325225}$

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$\sqrt{6345361}$

$\sqrt{6355441}$

$\sqrt{6365529}$

$\sqrt{6375625}$

$\sqrt{6385729}$

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$\sqrt{6405961}$

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INFORMATION SHEET

ELECTROMAGNETISM

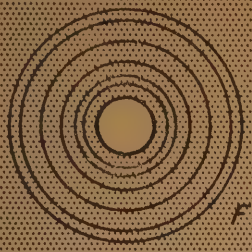


FIGURE 1

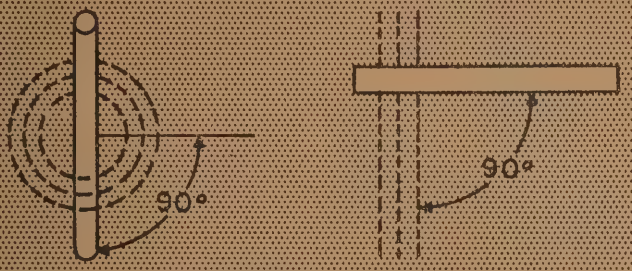


FIGURE 2

1. Shape and Direction of Magnetic Field.

Figure 1. *SHAPE* —
Concentric circles radiating at all points from the center of the straight conductor.

Figure 2. *DIRECTION* —
Right angles (90°) to the conductor.

2. Left Hand Rules to Determine Field Direction and Coil Polarity.

Figure 3. To determine *FIELD DIRECTION* *when direction of current flow is known.*
Grasp conductor in left hand so that thumb points in direction of current flow. *Fingers will point in direction of magnetic field.*

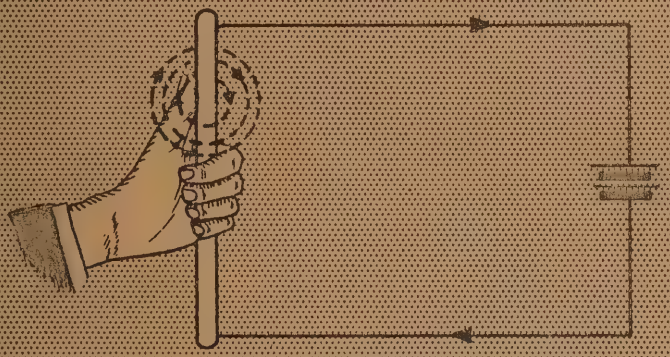


FIGURE 3

Figure 4. To determine *COIL POLARITY* *when direction of current flow is known.*
Grasp coil in left hand so that fingers point in direction of current flow around coil. Extend thumb at right angle to fingers. *Thumb will then point to north pole of coil.*

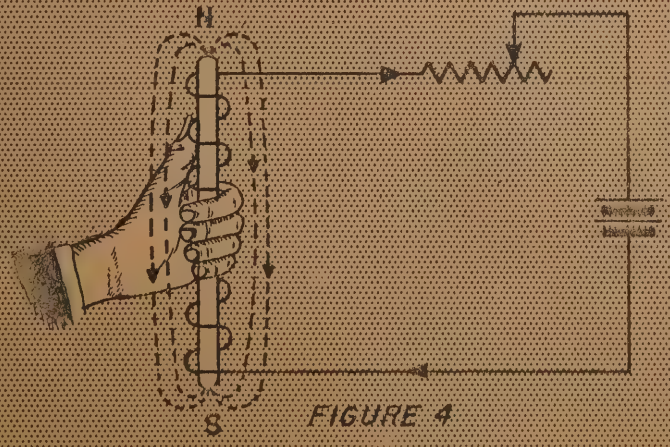
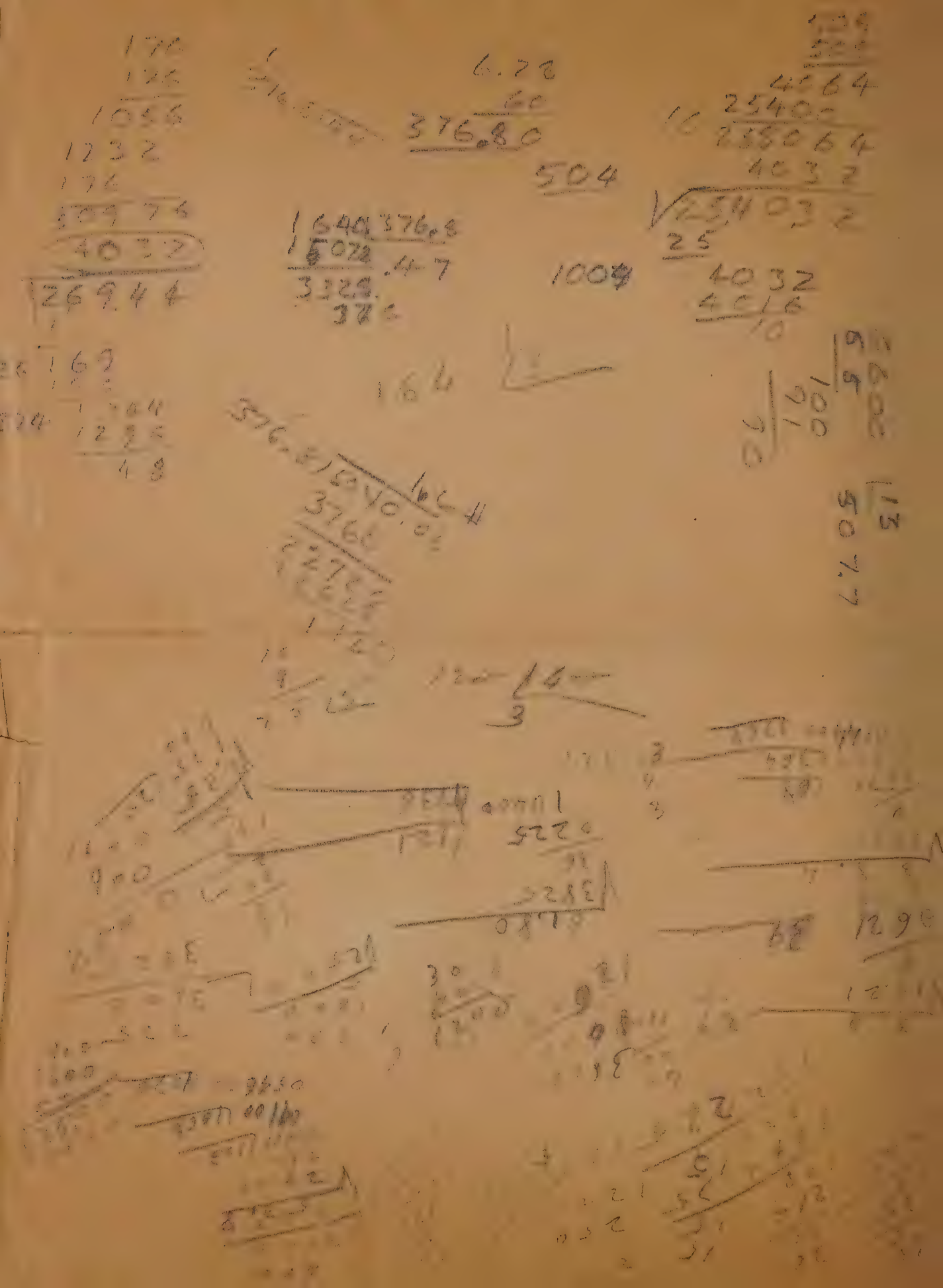
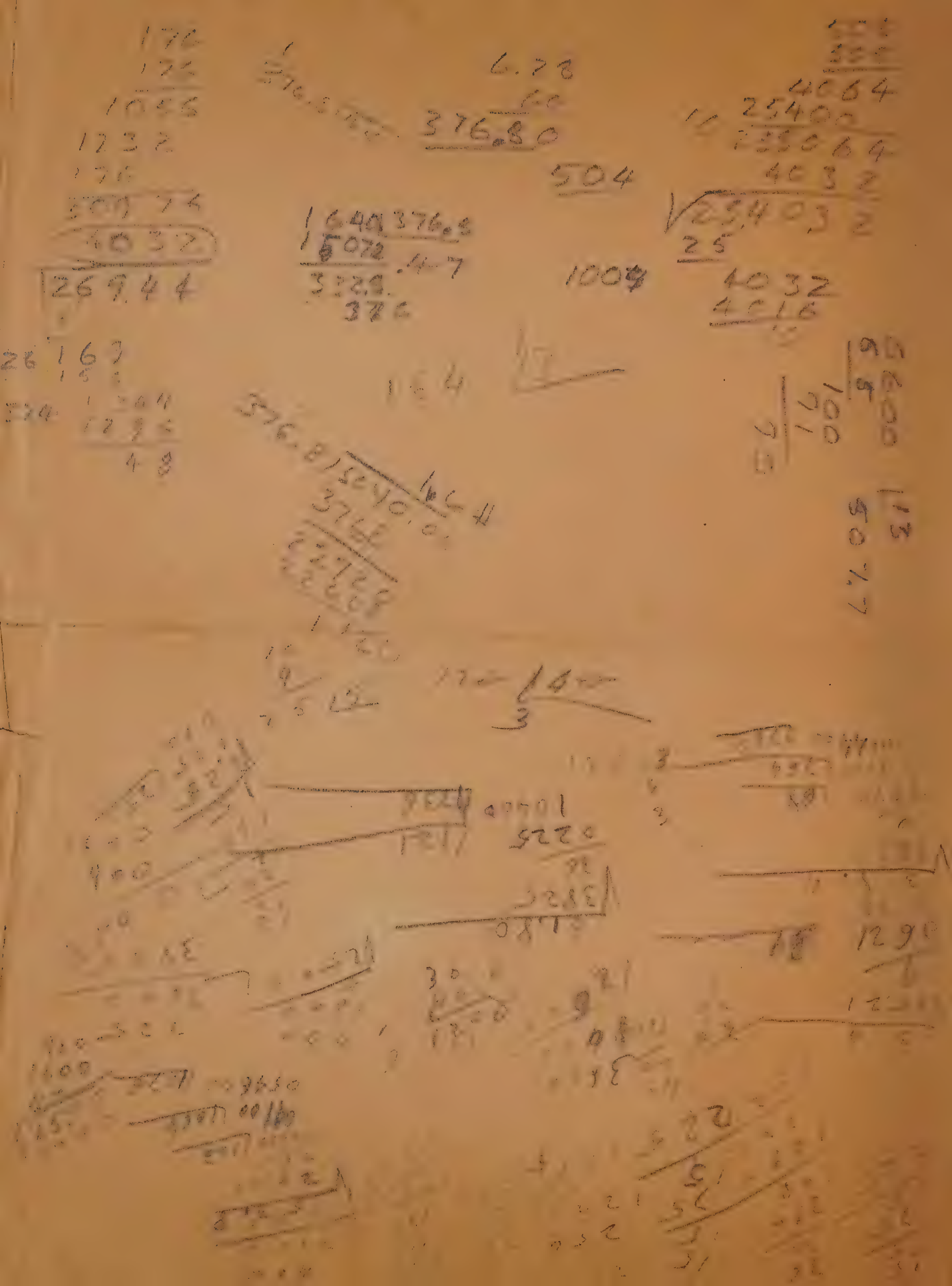


FIGURE 4





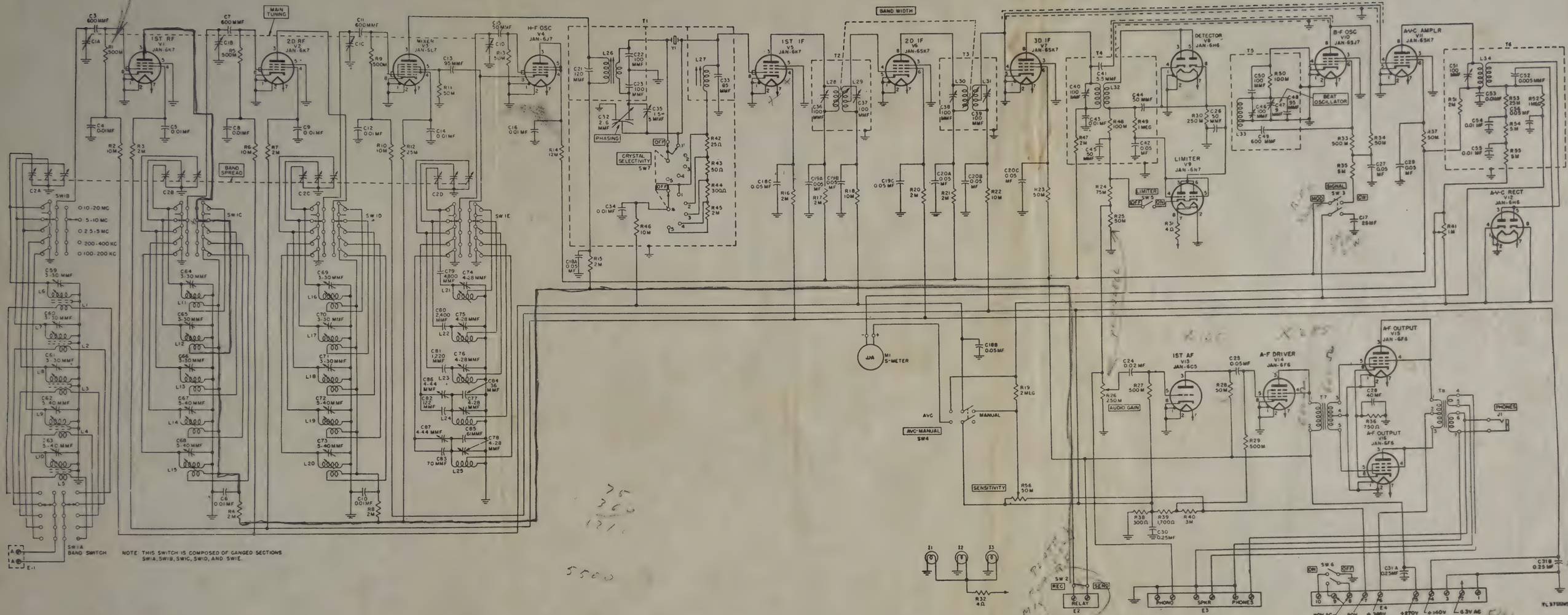
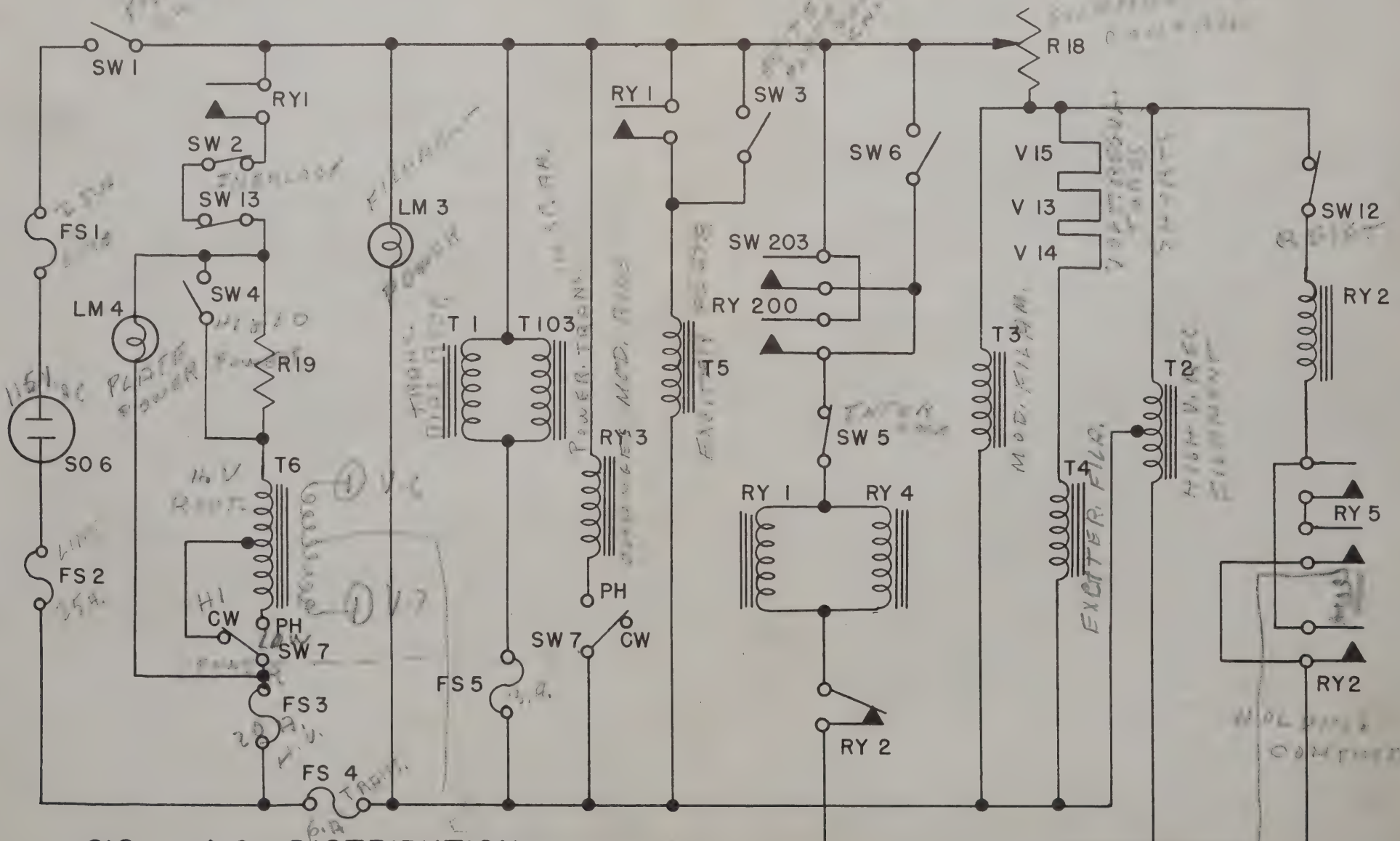
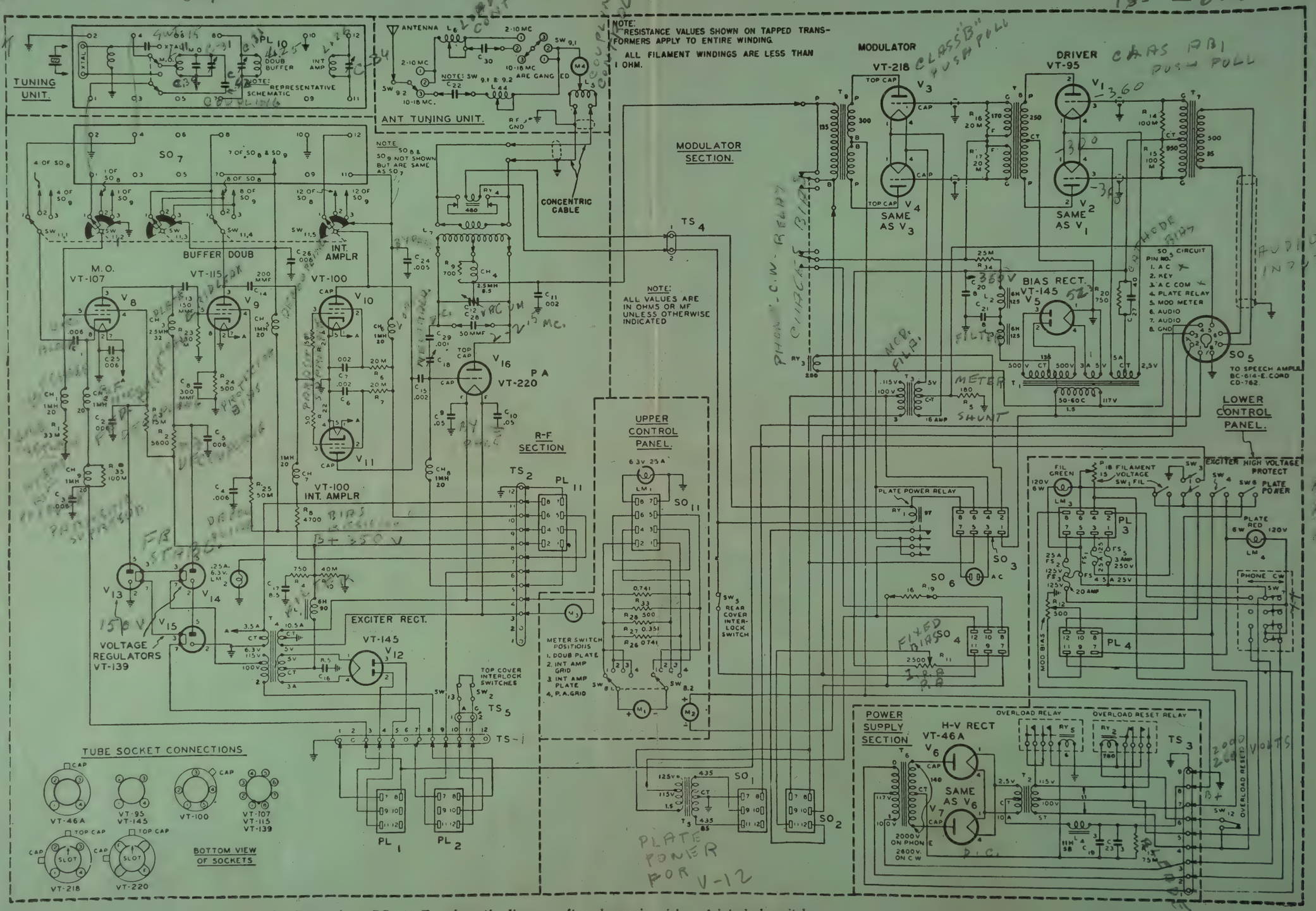


Figure 56. Radio Receiver, BC-779-A, -B, schematic diagram.



610 A.C. DISTRIBUTION

Army Ft McPherson Ga 847/52



Radio Transmitter BC-610-E—schematic diagram after change in wiring of interlock switches.

11-E-12/7-L5-LP2-D

MAY 1953

Army Ft McPherson Ga 542/54

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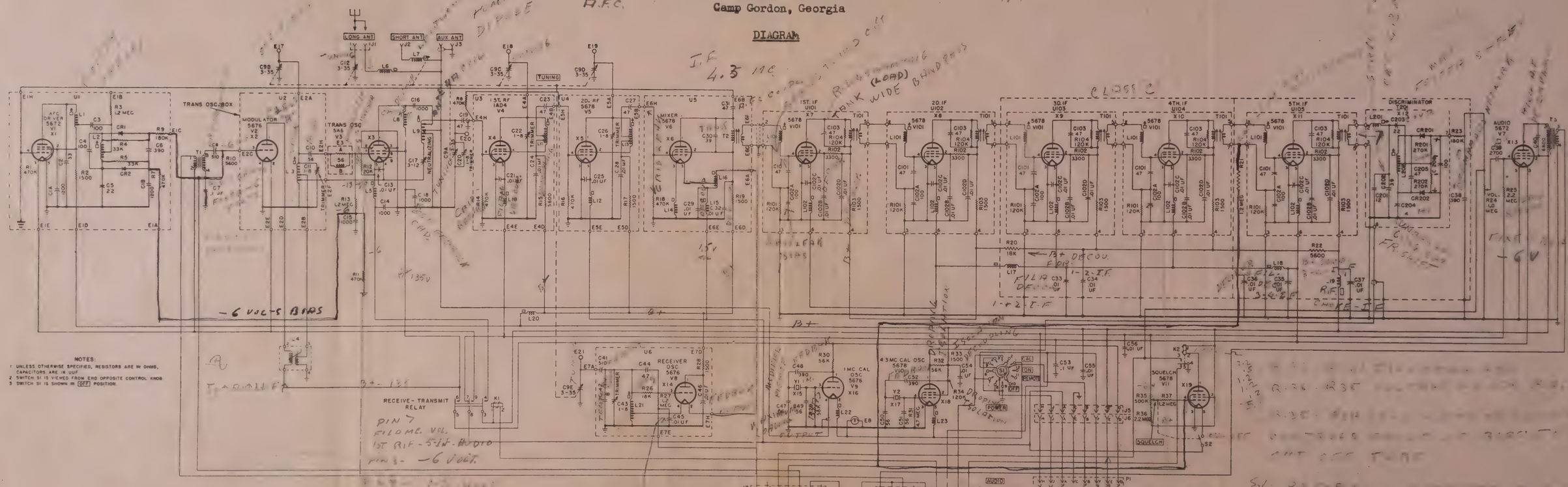
DIAGRAM



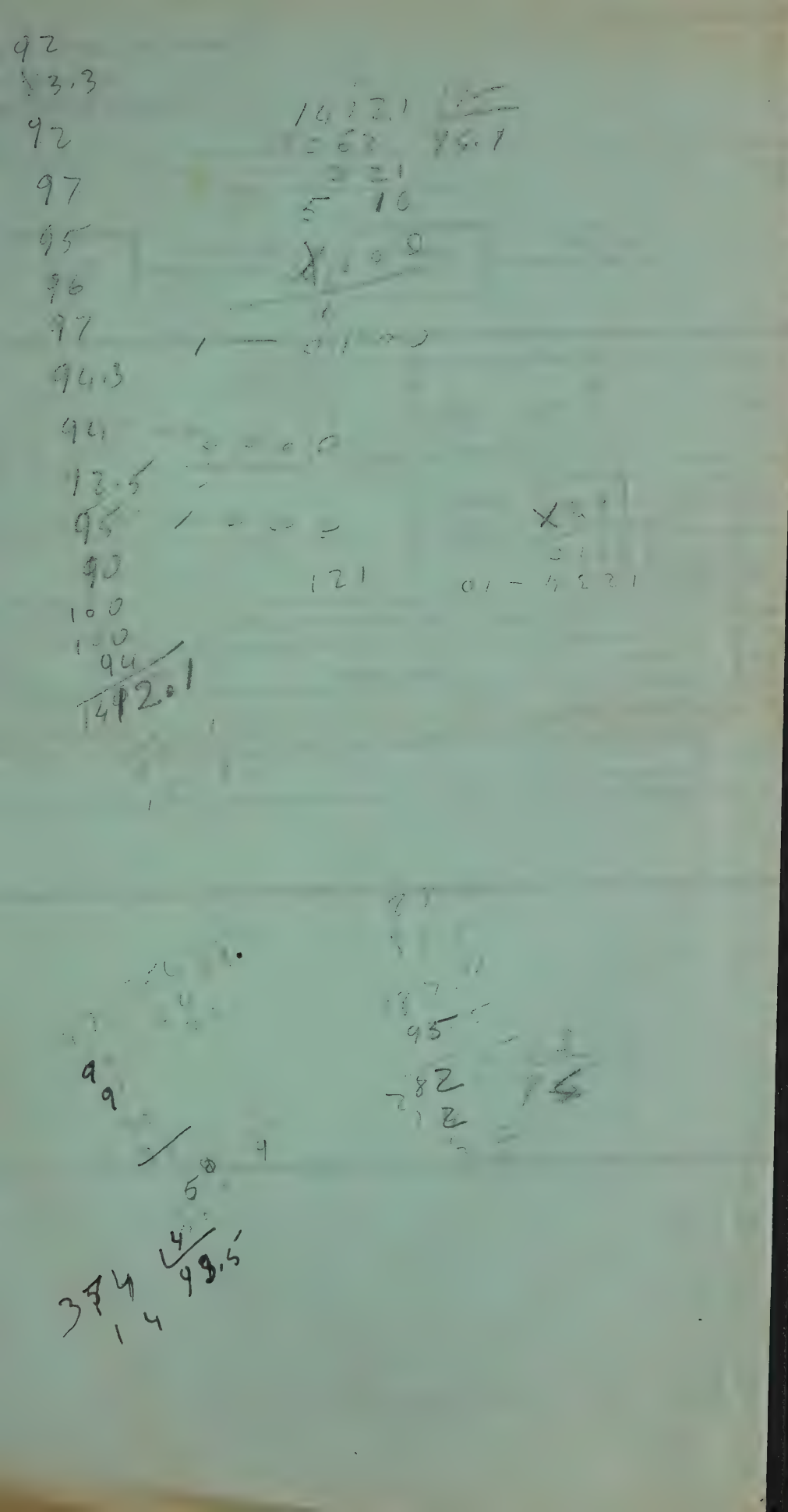
NOTES:
1 UNLESS OTHERWISE SPECIFIED, RESISTORS ARE IN OHMS, CAPACITORS ARE IN UUF
2 SWITCH S1 IS VIEWED FROM END OPPOSITE CONTROL KNOB
3 SWITCH S1 IS SHOWN IN OFF POSITION.

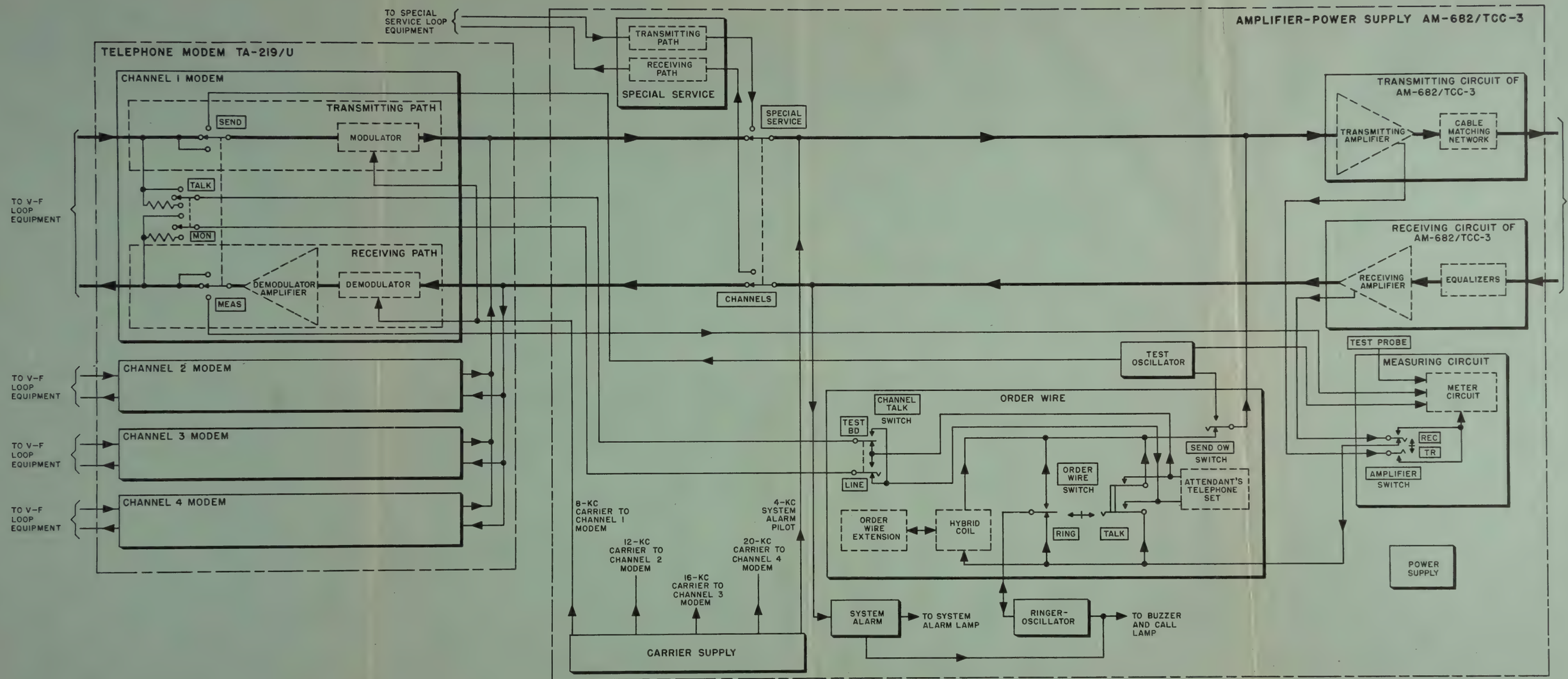
Radio Set AN/PRC-10, schematic diagram.

11-S-12/15-L3-IP16-D

Army Pt McPherson Ga 1638/54

October 1954





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Telephone Terminal AN/TCC-3, over-all block diagram.

Army Ft McPherson Ga 1181/54

July 1954

SCHEMATIC
AND
BLOCK DIAGRAMS
OF
RADIO TRANSMITTER BC-191

936. = 2 WIRE
FMC.

300 = WIRE
FMC.

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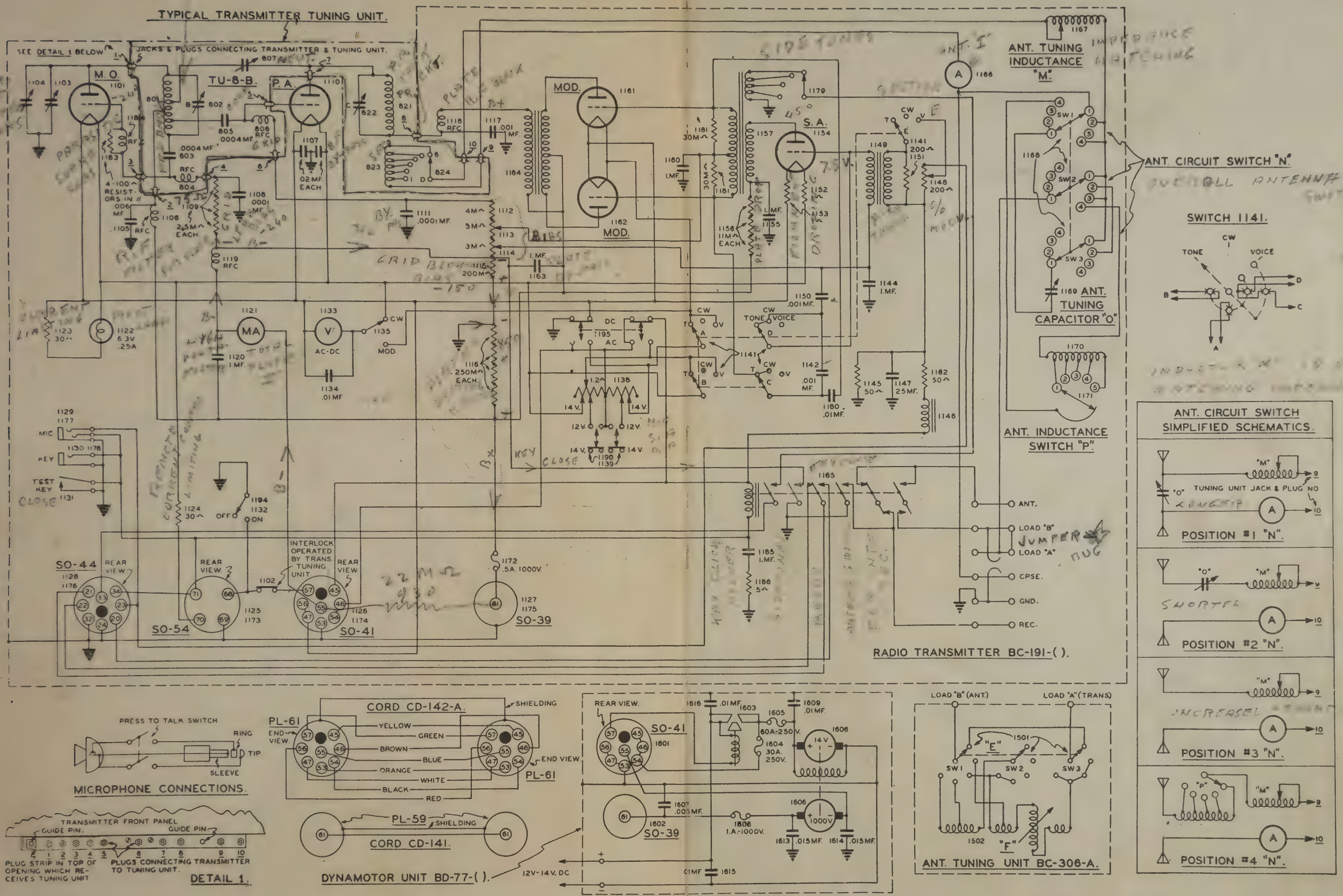
11-E-12 ZII-D

JULY 1954

Army Ft McPherson Ga 954/54



2. *Circuit diagram of the Radio Transmitter BC–191–(★).*

SCHEMATIC
AND
BLOCK DIAGRAMS
OF
RADIO TRANSMITTER BC-191

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11-E-12 ZII-D

JULY 1954

Army Ft McPherson Ga 954/54

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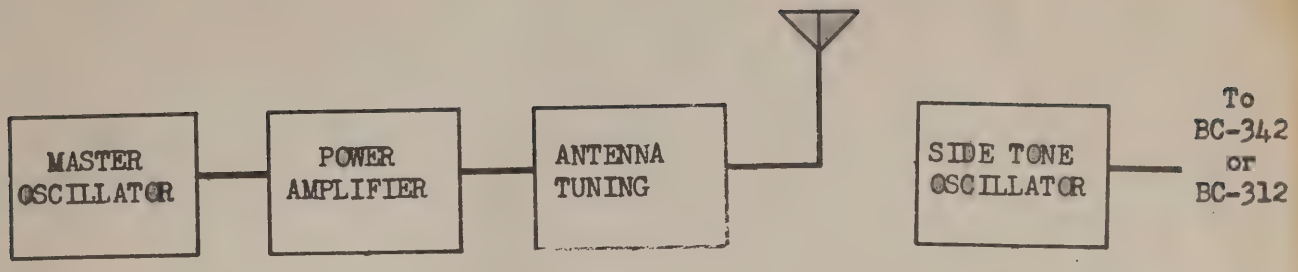
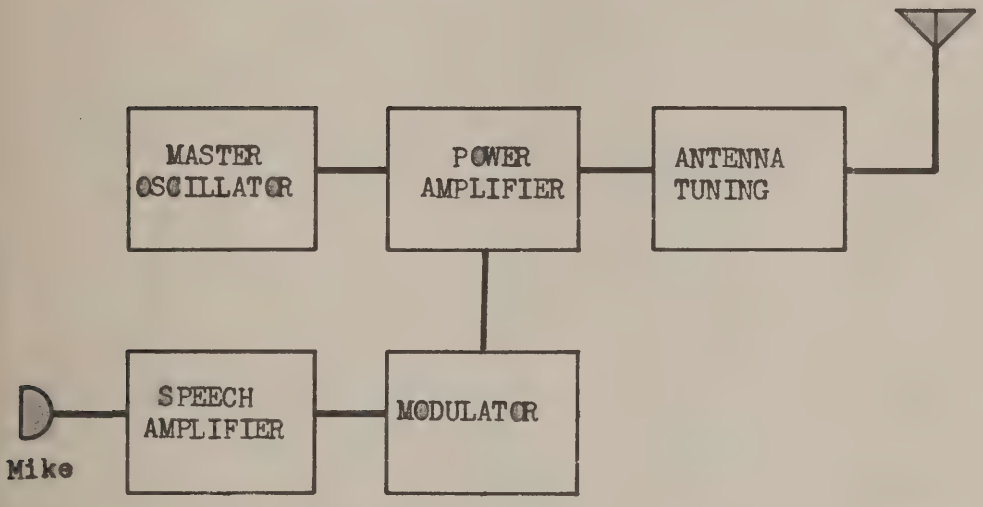
SCHEMATIC AND BLOCK DIAGRAMS

RADIO TRANSMTTTER BC-191

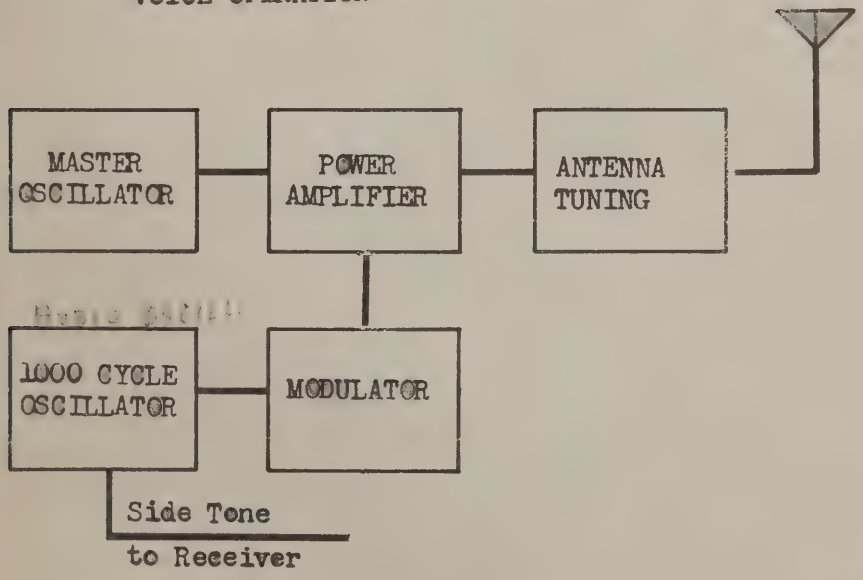
NUMBER	TITLE
1	Modes of Operation of Radio Transmitter BC-191
2	Circuit Diagram of the Radio Transmitter BC-191(*)
3	Speech Amplifier and Modulator on Voice Operation
4	Speech Amplifier as an Audio Oscillator on Tone and CW Operation
5	Simplified Diagram of Filament Circuit
6	Rectifier RA-34-J, Schematic Circuit Diagram



C-W OPERATION

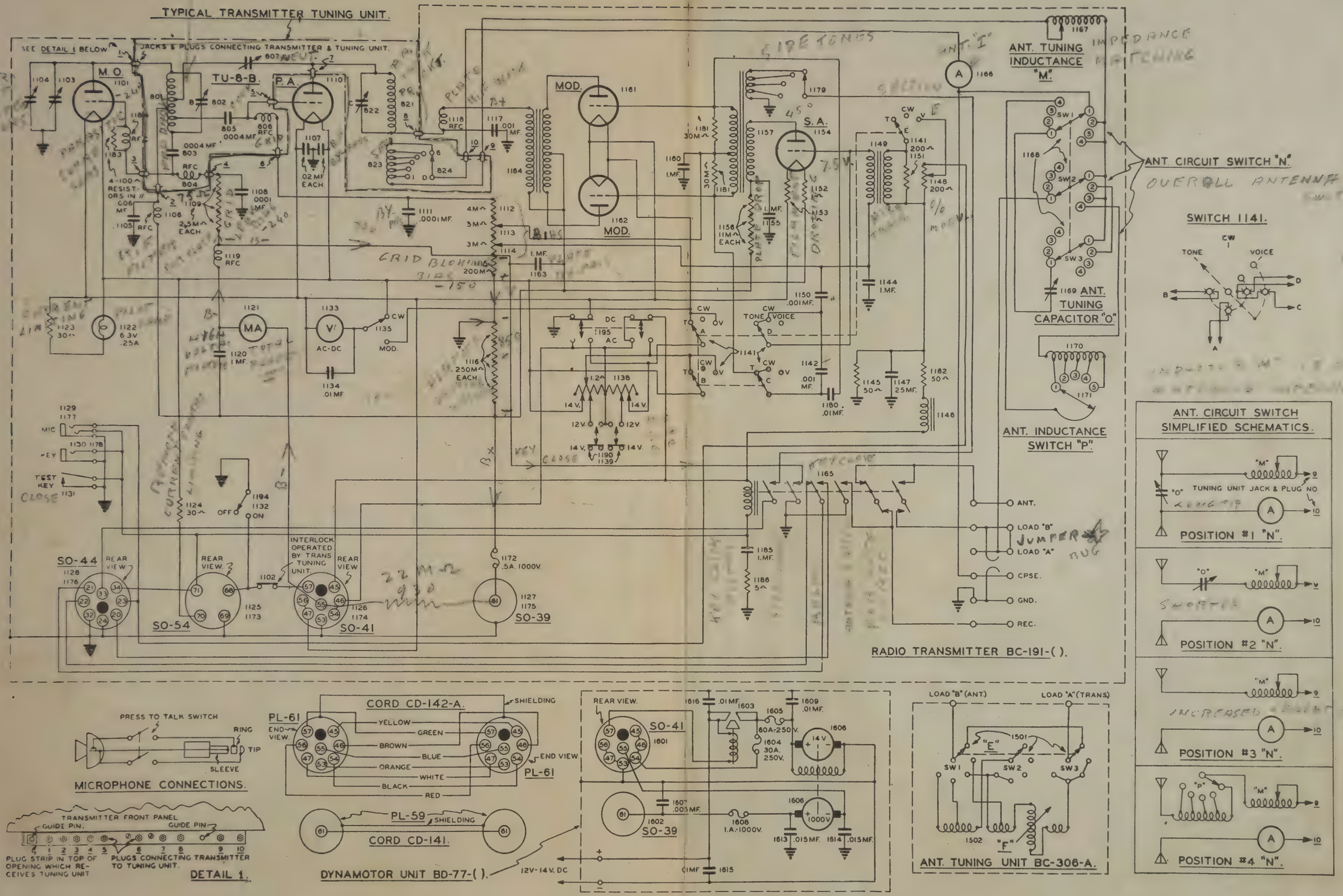


VOICE OPERATION

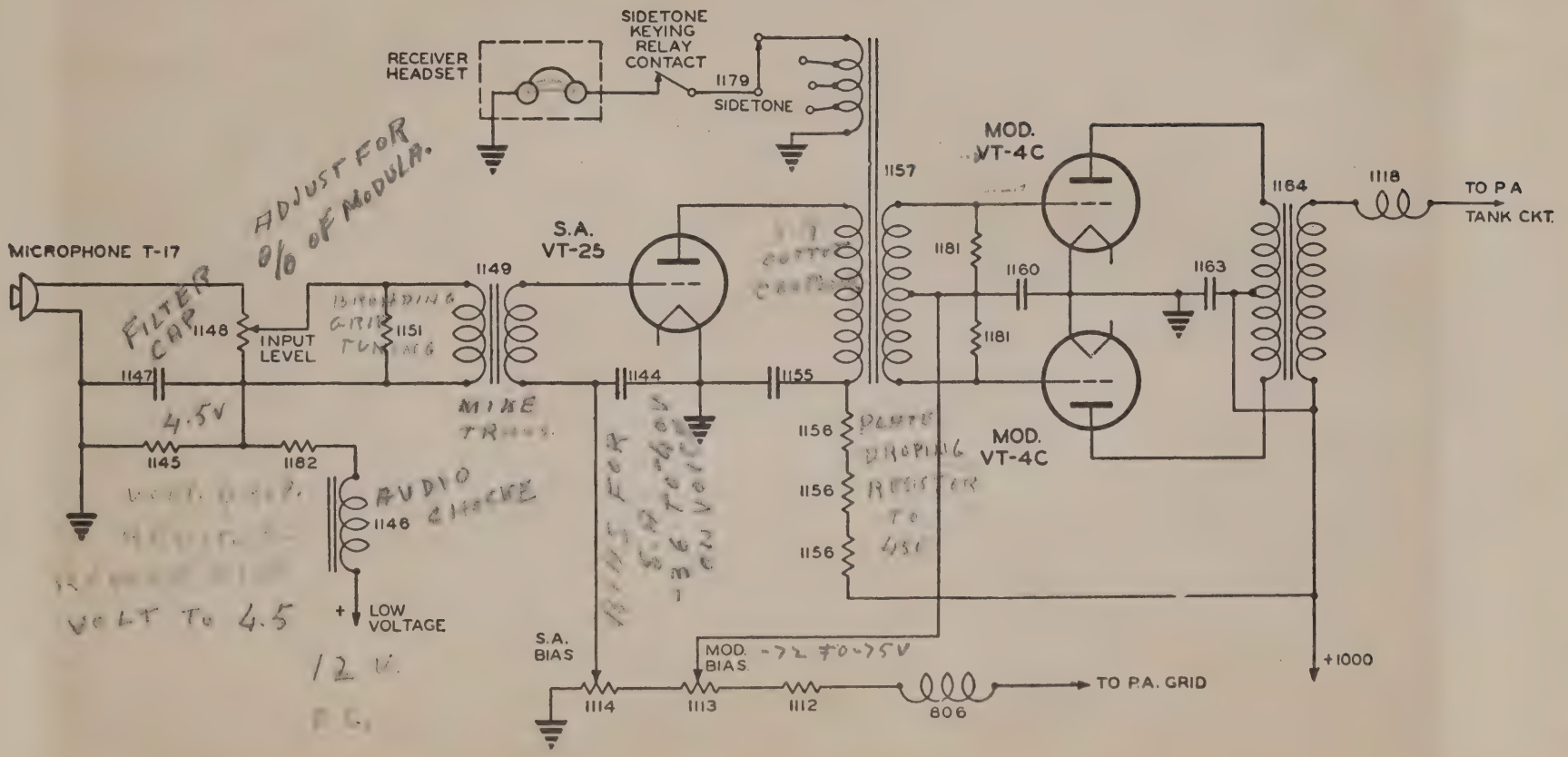


TONE OPERATION

I. MODES OF OPERATION OF RADIO TRANSMITTER BC-191


TYPICAL TRANSMITTER TUNING UNIT.
SEE DETAIL 1 BELOW
JACKS & PLUGS CONNECTING TRANSMITTER & TUNING UNIT.
M.O.
TU-8-B.
P.A.
MOD.
S.A.
ANT. TUNING INDUCTANCE "M."
ANT. CIRCUIT SWITCH "N."
SWITCH 1141.
TONE
VOICE
ANT. TUNING CAPACITOR "O."
ANT. INDUCTANCE SWITCH "P"
ANT. CIRCUIT SWITCH SIMPLIFIED SCHEMATICS.
TUNING UNIT JACK & PLUG NO
POSITION #1 "N".
POSITION #2 "N".
POSITION #3 "N".
POSITION #4 "N".
4-100 RESISTORS IN // .006 MF
2.5M EACH.
.02 MF. EACH.
4M
3M
3M
200M
250M EACH.
30M
11M EACH.
4-100 RESISTORS IN // .006 MF
.1 MF.
.01 MF
.005 MF.
.001 MF.
.0001 MF.
.0004 MF
.0004 MF
.1 MF.
1.2Ω
14 V.
12 V.
14 V.
12 V.
14 V.
1.A.-1000V.
.5A. 1000V.
30Ω
5Ω
50Ω
200Ω
200Ω
60A-250V.
30A. 250V.
14 V
1000V
.015 MF.
.015 MF.
.01 MF.
.01 MF.
.001 MF.
.001 MF.
.1 MF.
.1 MF.
.1

3. SPEECH AMPLIFIER AND MODULATOR ON VOICE OPERATION



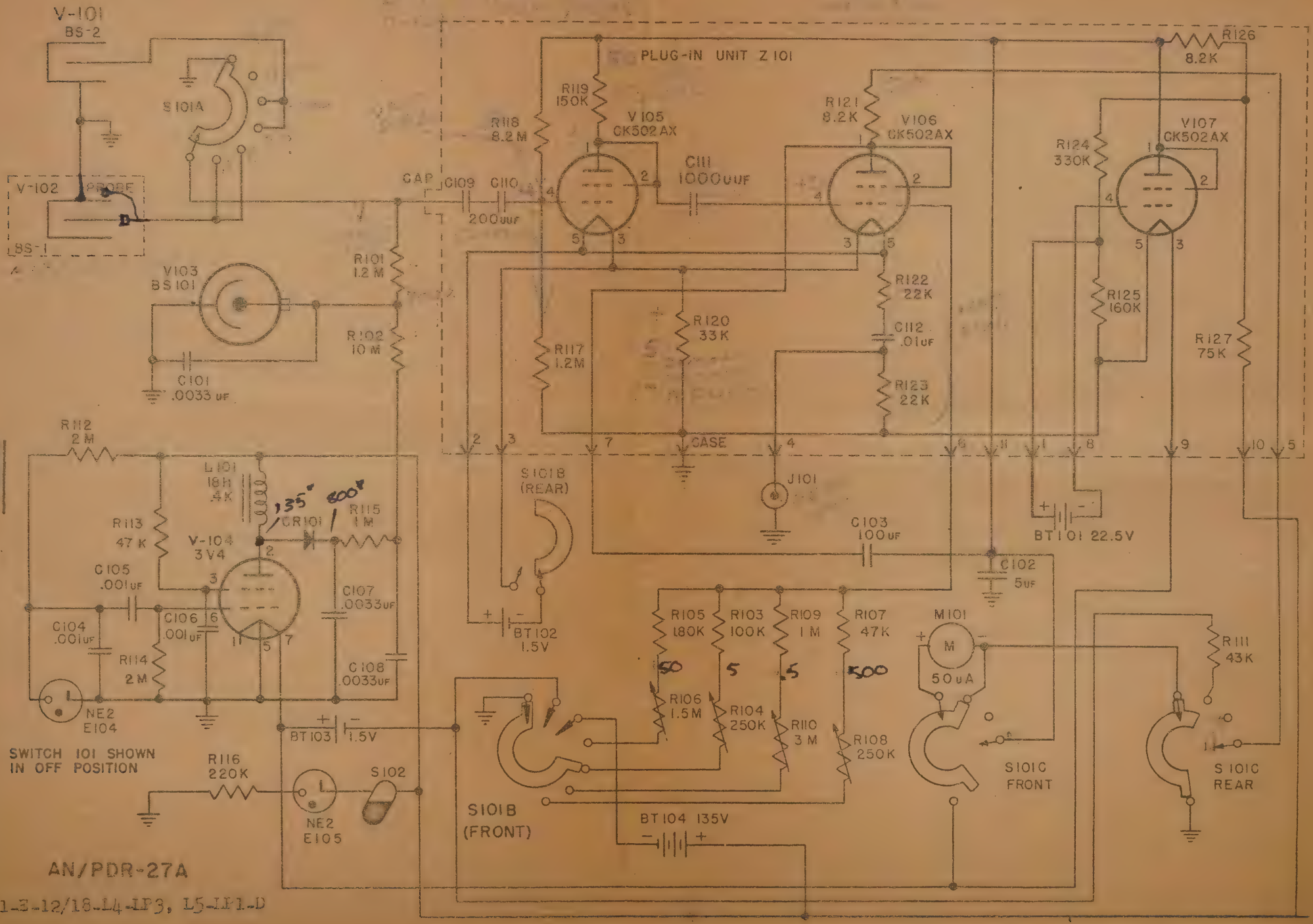


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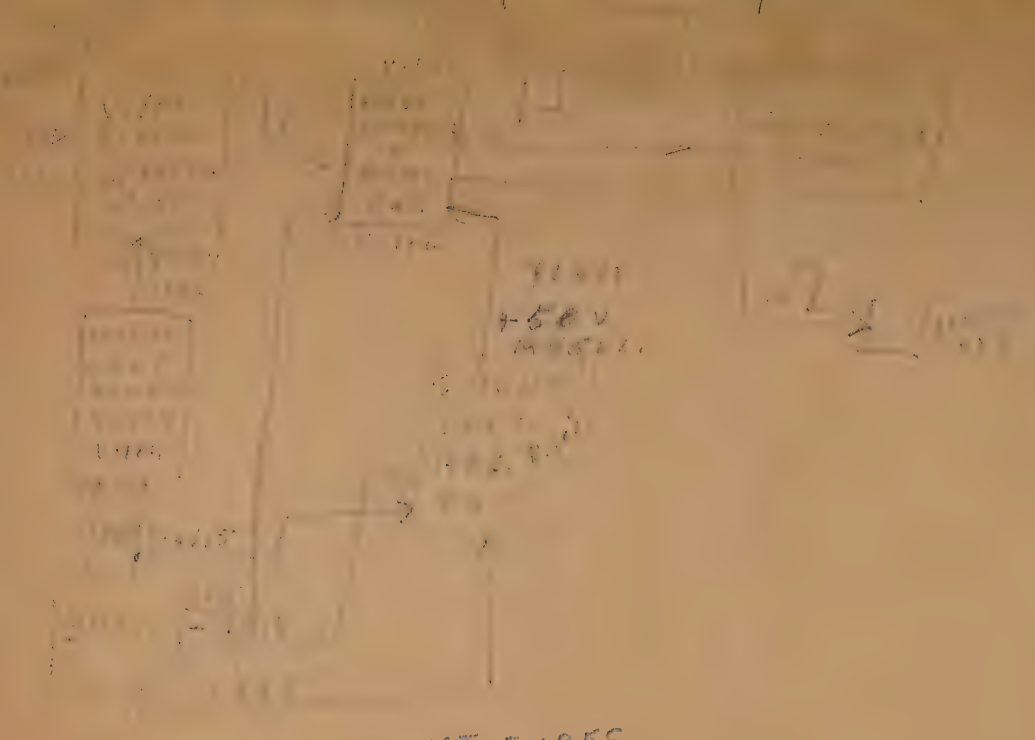
DIAGRAM

AN/PDR-27A

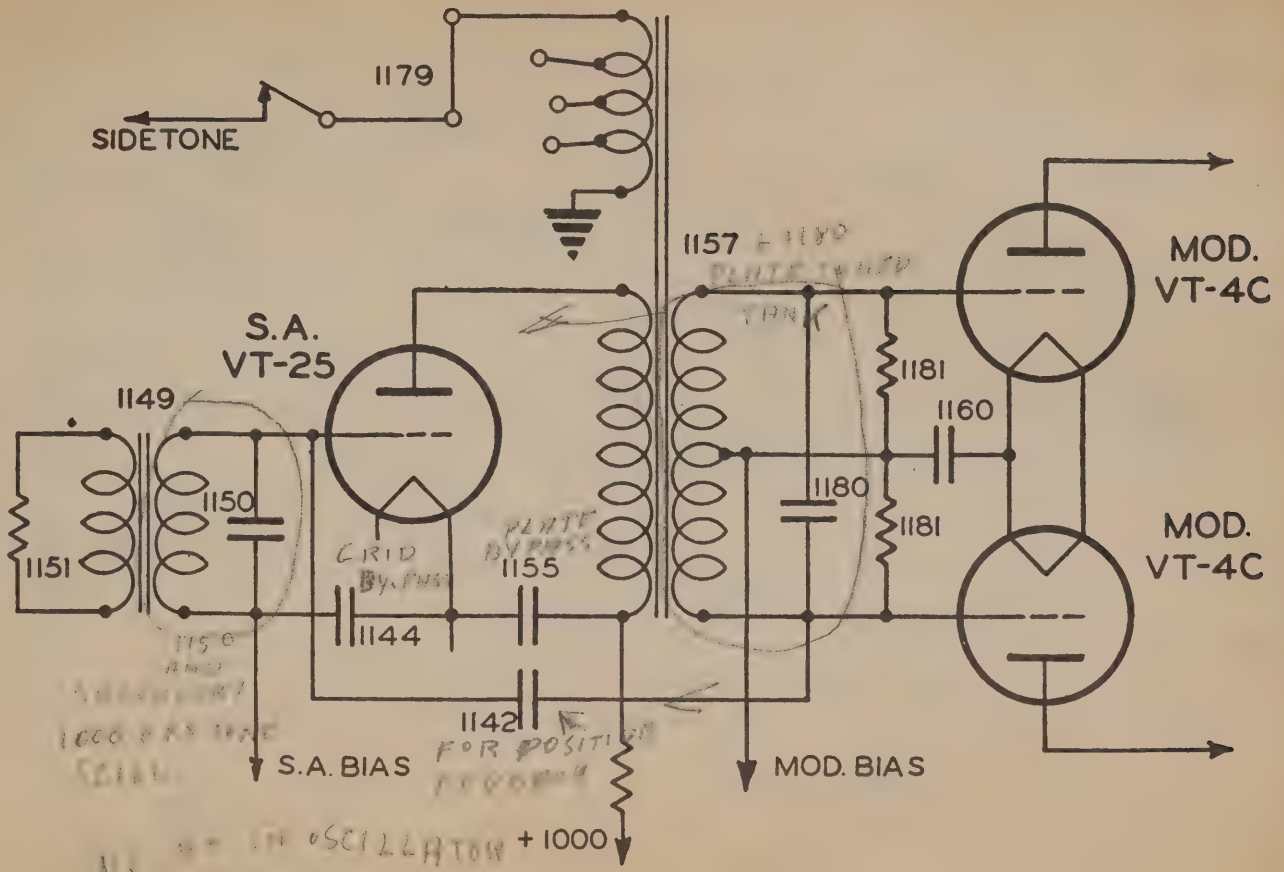
11-E-12/18-L4-IP3, L5-IP1-D

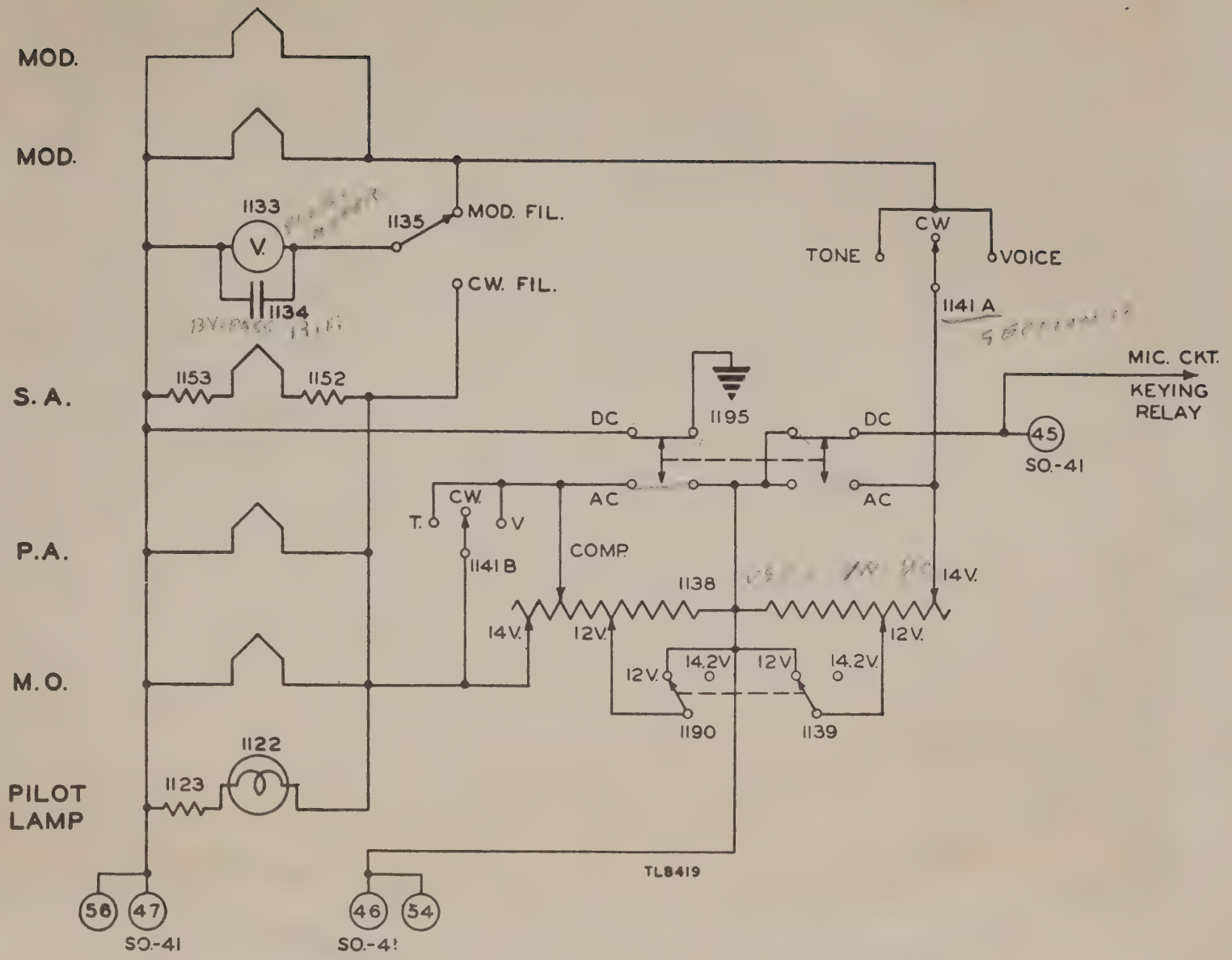


DEFECT. TUBES
PULSES. 80 M SECOND.

SHAPER & AMPLIFIER
TO EQUAL AMPLITUD AND

4. SPEECH AMPLIFIER AS AN AUDIO OSCILLATOR ON TONE AND CW OPERATION





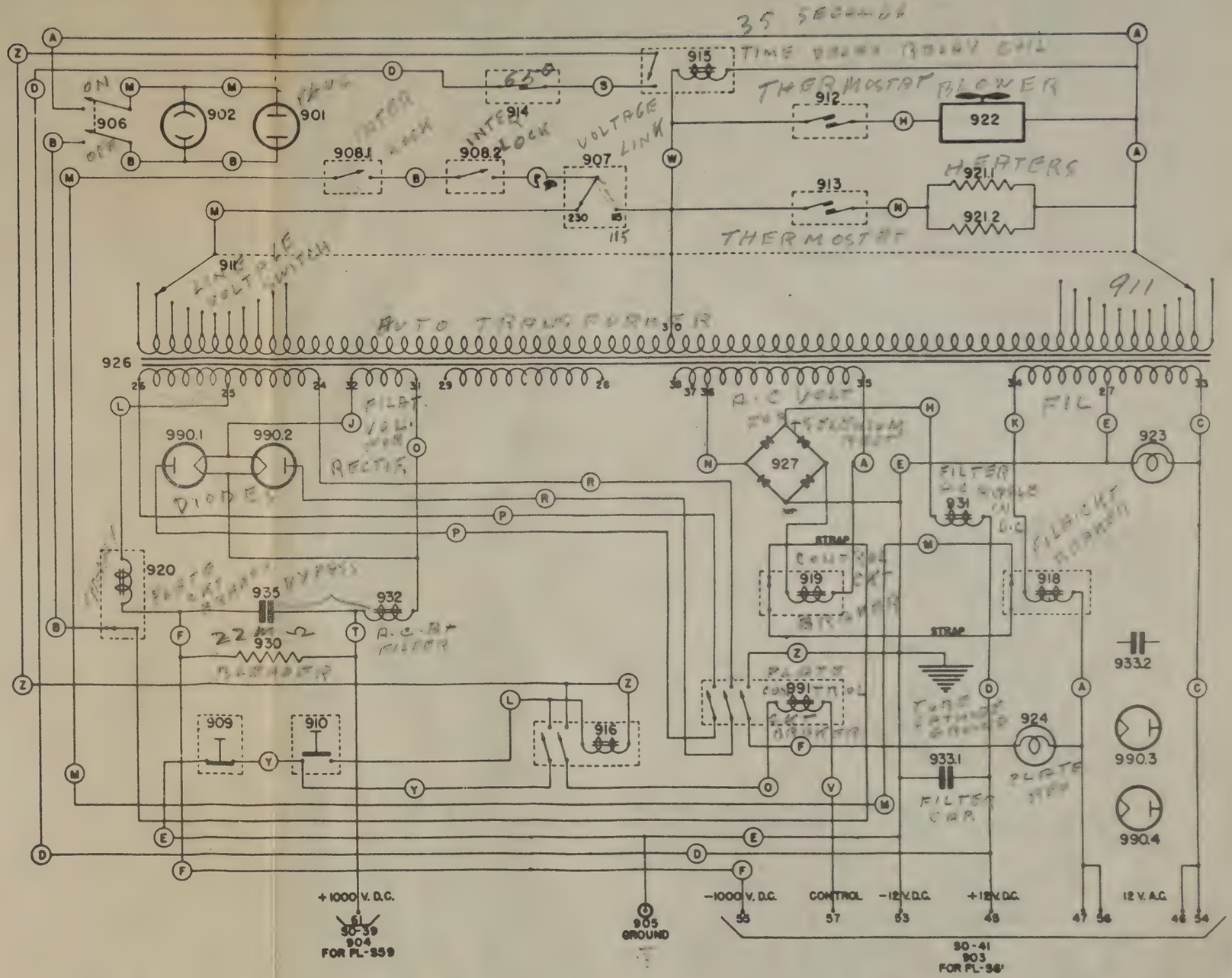
3. *Simplified diagram of filament circuit.*

WIRE COLOR CODE IDENTIFICATION TABLE

A—GREY	N—BLACK AND GREEN
B—BLACK	O—RED AND BLUE
C—BROWN	P—RED AND YELLOW
D—RED	R—RED AND GREEN
E—GREEN	S—BLUE AND YELLOW
F—BLUE	T—BLUE AND GREEN
H—YELLOW	V—CROSSED RED
J—BLACK AND RED	W—CROSSED BLACK
K—BLACK AND BROWN	X—CROSSED GREEN
L—BLACK AND BLUE	Y—CROSSED BROWN
M—BLACK AND YELLOW	Z—CROSSED YELLOW

NOTE: COLOR INDICATED IS TRACER COLOR.
ALL WIRES ARE GREY.

REF. No.	NAME OF PART	FUNCTION
901	SOCKET	FOR CORD CD-370
902	SOCKET	EMERGENCY POWER
903	SOCKET SO-41	FOR CORD CD-151
904	SOCKET SO-39	FOR CORD CD-152
905	BINDING POST	GROUND
906	SWITCH	POWER
907	LINK	115-230 VOLT LINE SET
908.1	SWITCH	INTERLOCK
908.2	SWITCH	INTERLOCK
909	SWITCH	PLATE OFF
910	SWITCH	PLATE ON
911	SWITCH	LINE VOLTAGE
912	THERMOSTAT	BLOWER
913	THERMOSTAT	TUBE HEATER
914	THERMOSTAT	PLATE
915	RELAY	TIME DELAY
916	RELAY	PLATE ON-OFF
918	CIRCUIT BREAKER	FILAMENT
919	CIRCUIT BREAKER	CONTROL
920	CIRCUIT BREAKER	PLATE
921.1	HEATER	RECTIFIER TUBE
921.2	HEATER	RECTIFIER TUBE
922	BLOWER	VENTILATION
923	PILOT LAMP	POWER PILOT
924	PILOT LAMP	PLATE PILOT
926	TRANSFORMER	POWER
927	RECTIFIER	CONTROL VOLTAGE
930	RESISTOR	PLATE RECTIFIER BLEEDER
931	REACTOR	CONTROL RECTIFIER FILTER
932	REACTOR	PLATE RECTIFIER FILTER
933.1	CAPACITOR	CONTROL RECTIFIER FILTER
933.2	CAPACITOR	SPARE
935	CAPACITOR	PLATE RECTIFIER FILTER
990.1	TUBE JAN-866-A	PLATE RECTIFIER
990.2	TUBE JAN-866-A	PLATE RECTIFIER
990.3	TUBE JAN-866-A	SPARE
990.4	TUBE JAN-866-A	SPARE
991	RELAY	PLATE CONTROL



6. *Rectifier RA-34-J, schematic circuit diagram.*

25000

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INFORMATION SHEET

ELECTROMAGNETISM

1. Shape and Direction of Magnetic Field.

Fig 1. Shape - Concentric circles radiating at all points from the center of the straight conductor.

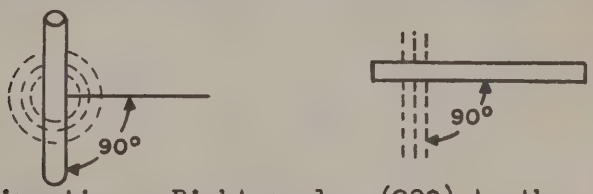
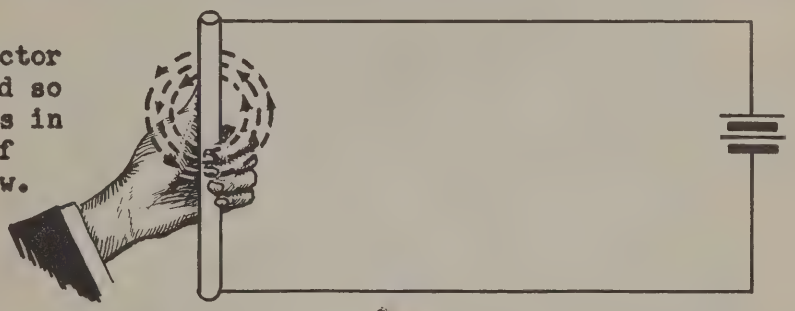


Fig 2. Direction - Right angles (90°) to the conductor.

2. Left Hand Rules to Determine Field Direction and Coil Polarity.

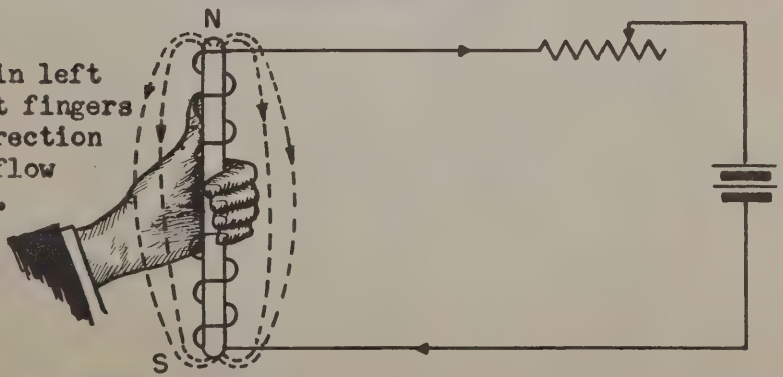
Grasp conductor in left hand so thumb points in direction of current flow.



Fingers will point in direction of magnetic field.

Fig 3. To determine field direction when direction of current flow is known.

Grasp coil in left hand so that fingers point in direction of current flow around coil.



Extend thumb at right angle to fingers. Thumb will then point to north pole of coil.

Fig 4. To determine coil polarity when direction of current flow is known.

END

Army Ft McPherson Ga 297/54

120

60 W

120 | 60
000 | 2

120
12
240

120 | 2
60

60 | 120
2"

W - V

W = I² R

P = I × R

P 210.0
105 746
60 2205
24 13
0 0 1

3 13
1

60 | 120
00 .5

150 | 25
0 0 6

20 | 10
0 0 2

10

SCHEMATIC DIAGRAMS OF STANDARDIZED SERIES OF F-M SETS

THE SOUTHEASTERN SIGNAL SCHOOL

Camp Gordon, Georgia

11-E-12/17-D

SEPTEMBER 1954

Army Ft McPherson Ga 1480/54

THE SOUTHEASTERN SIGNAL SCHOOL
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SCHEMATIC DIAGRAMS

STANDARDIZED SERIES OF F-M SETS

NUMBER	TITLE
1	Radio Receiver R-108/GRC, Schematic Diagram
2	AF Amplifier AM-65/GRC, Schematic Diagram
3	Receiver-Transmitter RT-70/GRC, Schematic Diagram
4	Power Supply PP-112/GR, Schematic Diagram
5	Receiver-Transmitter RT-66/GRC, Schematic Diagram
6	Set 1 Filament Circuit, Schematic Diagram
7	Radio Sets AN/GRC 3-8, Power Distribution and Control Circuits with Control Box
8	Control Group AN/GRA-6, Schematic Diagram
9	Retransmission Circuits
10	Radio Receiver R-108/GRC, Filament Circuit
11	Receiver-Transmitter RT-66/GRC, Filament Circuit

MEDIUM POWER TRANS-RECEIVER
9-16 WATTS OUTPUT

SET-1 (AIR BORNE) - AN/GRC-3-4 (10-15 MILES)

R.T-66 - FR. 20.-27.9 M.C. - 80 CHANNELS

100 KC. CHANNEL WIDTH.

SET-1 (INFANTRY) AN/GRC-5-6

R.T. 67 FR. 27 - 38.9 Mc. - 120 CHANNEL (100Kc)

SET-1 (INFANT.) AN/GRC-7-8

R.T. 68 - FR. 38 - 54.9 MC. - 170 CHANNEL. (100 KC) WIDTH

OUTPUT - 9-16 WATTS.

LOW POWER TRANS. RECEIVER
- POWER OUTPUT - ¼ WATT - (1-3 MILES)

SET-2 - R.T. 70 FR. 47-58.4 MC.

AUXILIARY EQUIPMENT WITH AN/GRC 3-5-7

- WITH AN/GRC-3 R-108 FR. 20-27.9 MC.
- " AN/GRC-5 R-109 " 27-38.9 MC.
- " AN/GRC-7 R-110 " 38-54.9 MC.

} WITH POWER UNIT

INTERPHONE AMP - AM-65 2 FUNCTIONS (1) FOR INTERCOM.
(2) POWER SUPPLY FOR R.T-70

3 PLUG-OUT PANELS - FOR 6 VOLTS P.P. 108
FOR 12 " P.P. 281
FOR 24 " P.P. 282
} 135 VOLTS

SYNCHRONIZED VIBRATORS

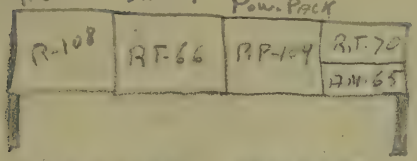
POWER UNIT FOR MEDIUM POWER TRANS-RECEIVER

FOR - 12 V - P.P. 109
" 24 V - P.P. 112
} 35 WATTS

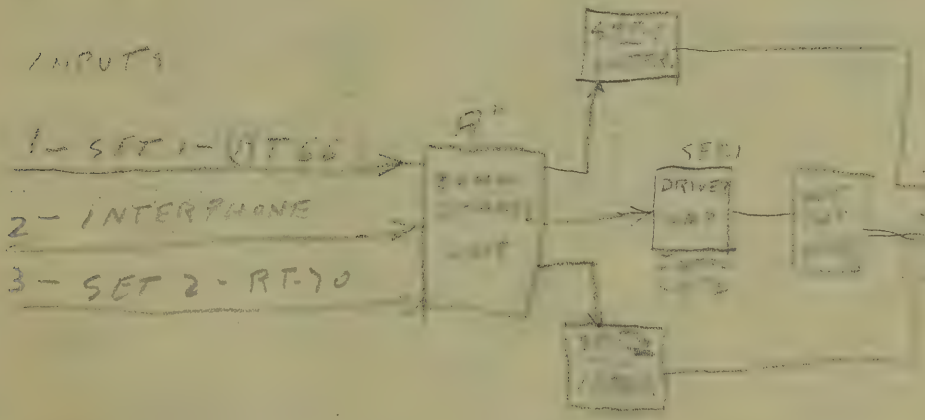
MEDIUM AN/GRC-10

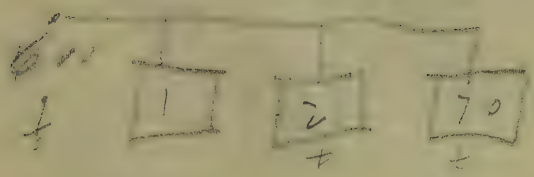
AN/GRC-3

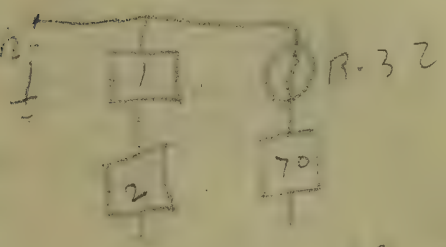
AUXI. SET-1 Pow. PACK

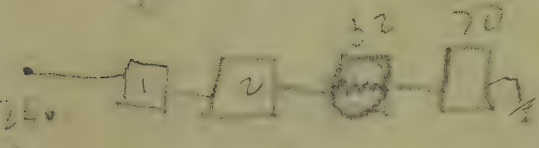


MINUS R-108 IS AN/GRC-4









AIR RIDGE POWER TRANSCEIVER SET
9-16 WATTS OUTPUT

SET 1 (AIR FORCE) – AN/GRC-3-4 (10-15 MILES)

R.T. 66 – FR. 20-27.9 MC. – 80 CHANNELS

100 KC. CHANNEL WIDTH.

SET-1 (ARTILLERY) AN/GRC-5-6

R.T. 67 FR. 27 – 38.9 Mc. – 120 CHANNELS (100 KC)

SET-1 (INFANTRY) AN/GRC-7-8

R.T. 68 FR. 38-54.9 MC. – 170 CHANNEL (100 KC) WIDTH

OUTPUT – 9-16 WATTS.

LOW POWER TRANS-CEIVER
SET-2 – POWER OUTPUT – ¼ WATT – (1-3 MILES)
R.T. 70 FR. 47-58.4 MC.

AUXILIARY RECEIVER WITH AN/GRC 3-5-7

WITH AN/GRC-3 R-108 FR. 20-27.9 MC.
" AN/GRC-5 R-109 " 27-38.9 MC.
" AN/GRC-7 R-110 " 38-54.9 MC.

} POWER SUPPLY

INTERPHONE UNIT – AN 65 2 FUNCTIONS (1) INTERCOM.
(2) POWER SUPPLY FOR R.T. 70

2 POWER PACKS – FOR 6 VOLTS P.P. 46
FOR 12 " P.P. 281
FOR 24 " P.P. 282

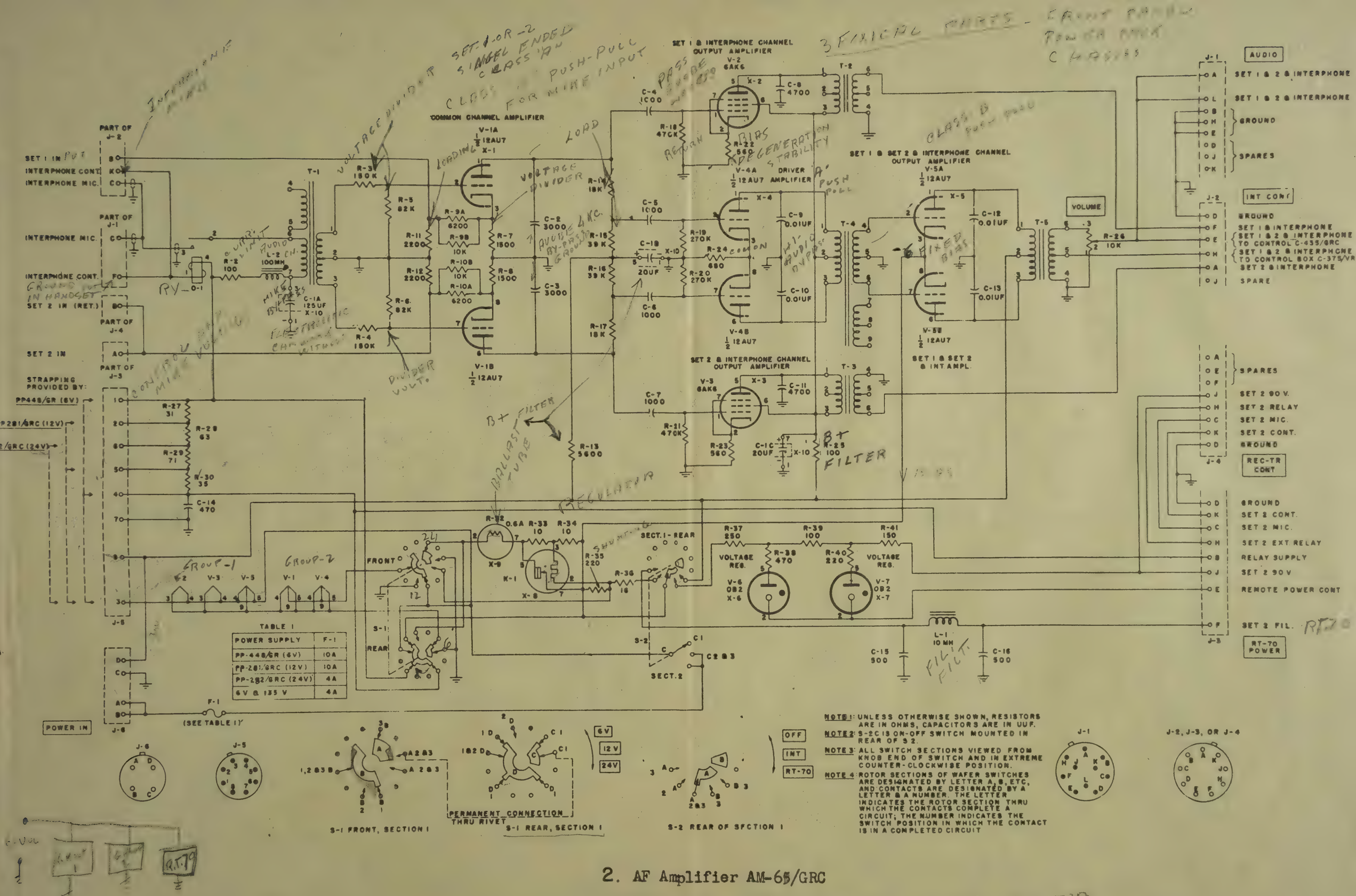
SYNCRONOUS VIBRATORS } 115 VOLT

POWER UNIT FOR MEDIUM POWER TRANSCEIVER

FOR 12 V – P.P. 109
" 24 V – P.P. 112

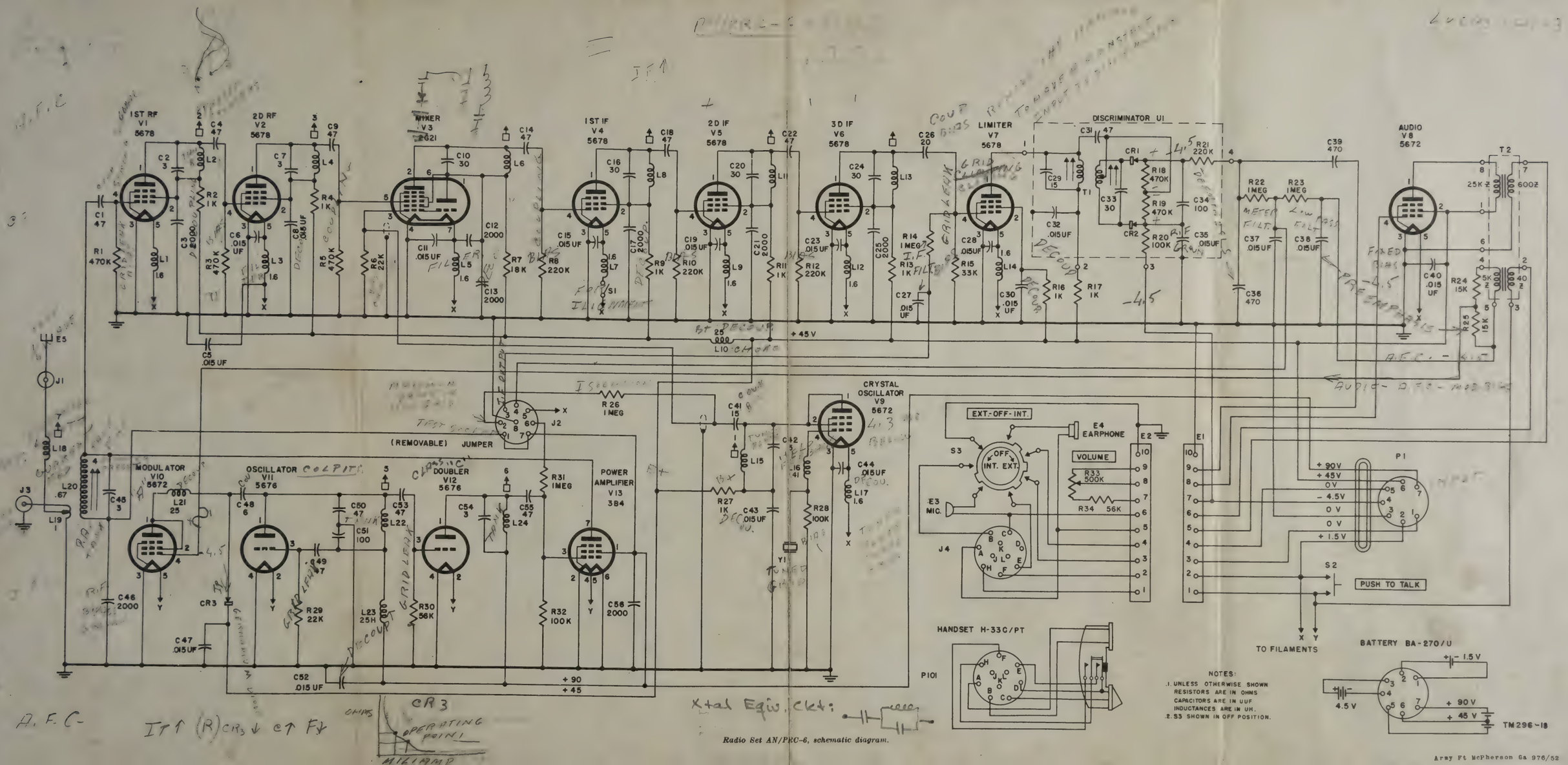
} 3 PINS

NEW AN/GRC 10



2. AF Amplifier AM-65/GRC

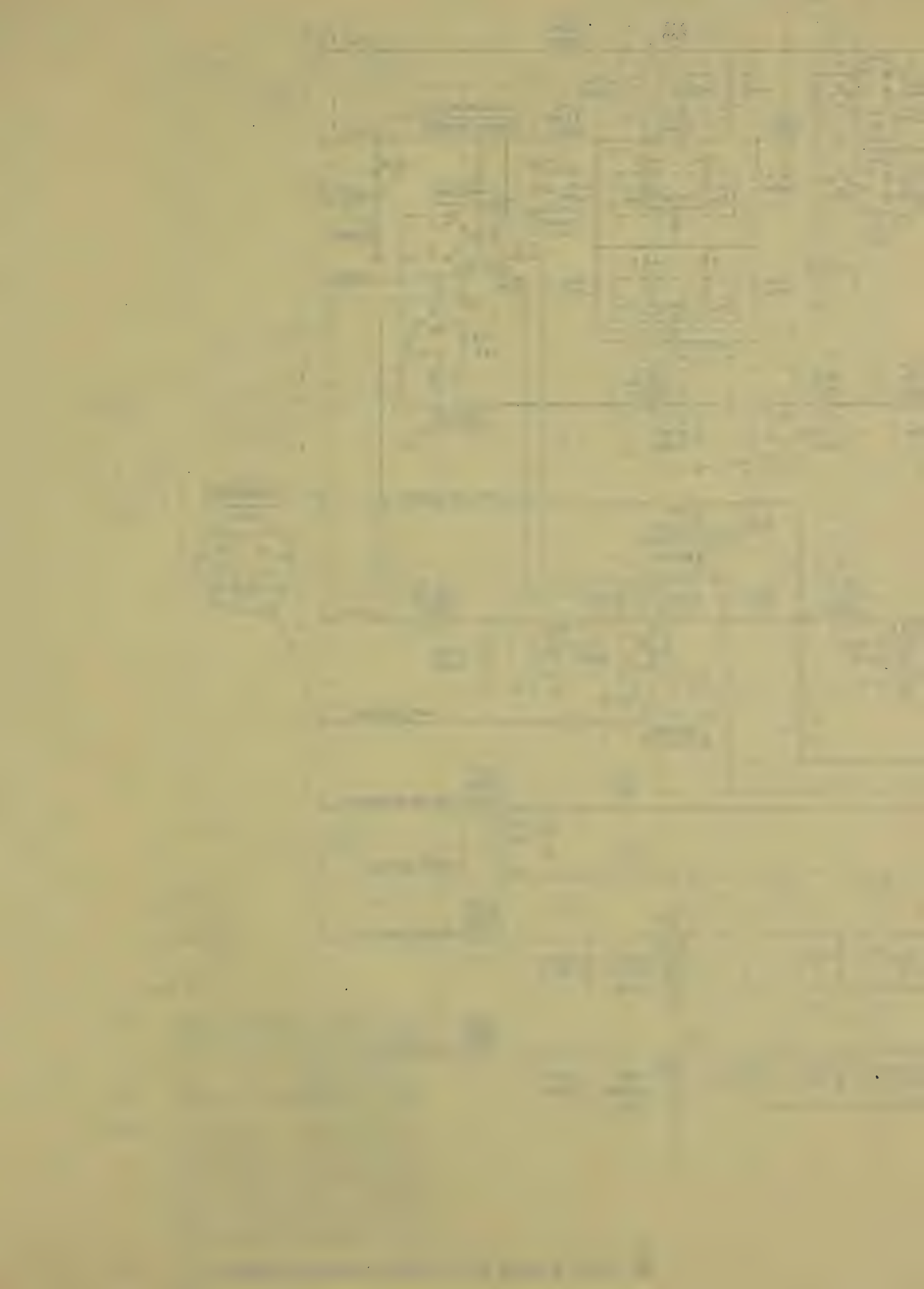
3 CHANEL AUDIO AMP - ELECTRONIC MIXER - MONITOR.

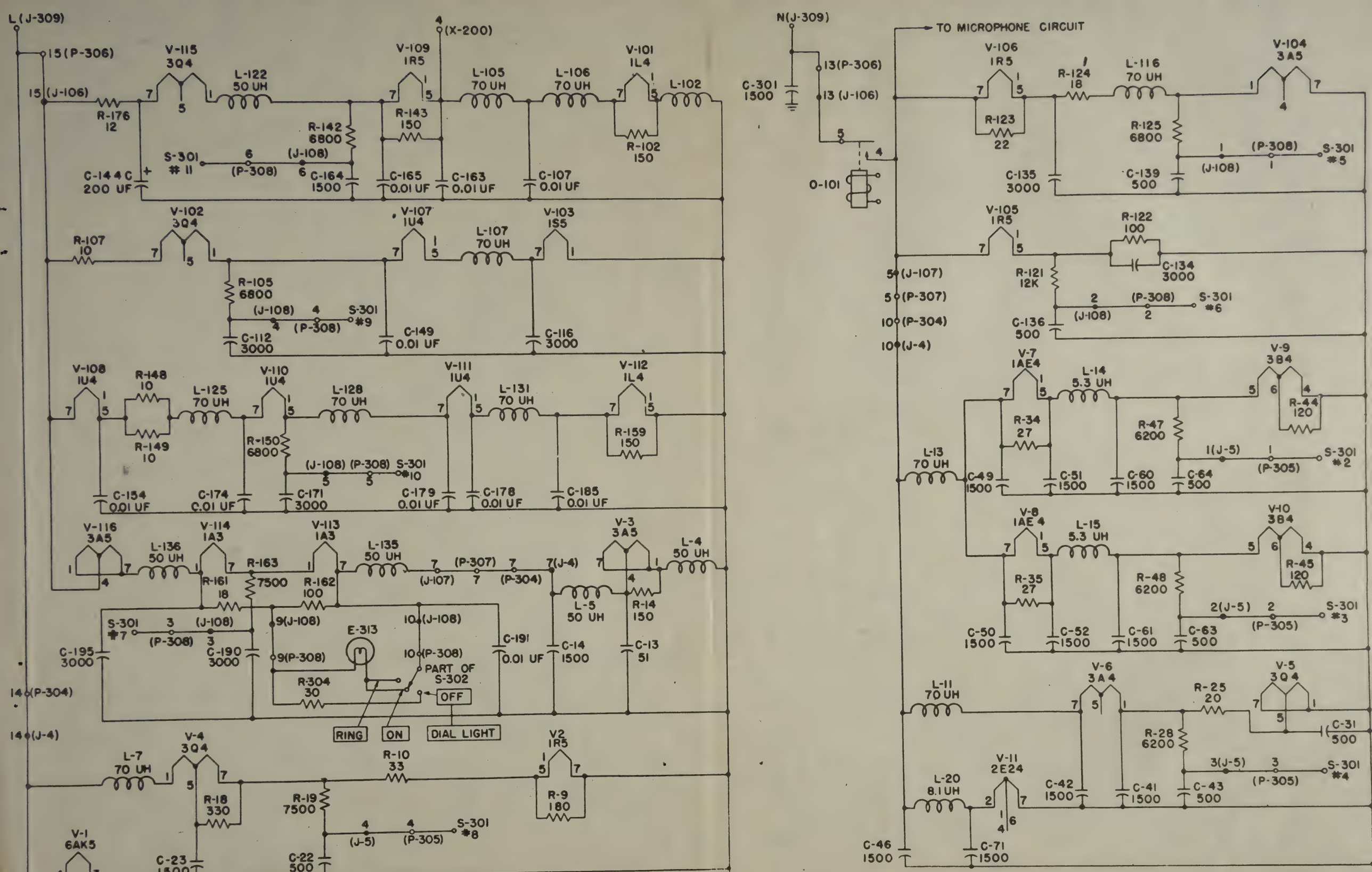


NOTES:
1. UNLESS OTHERWISE SHOWN RESISTORS ARE IN OHMS CAPACITORS ARE IN UUF INDUCTANCES ARE IN UH.
2. S3 SHOWN IN OFF POSITION.

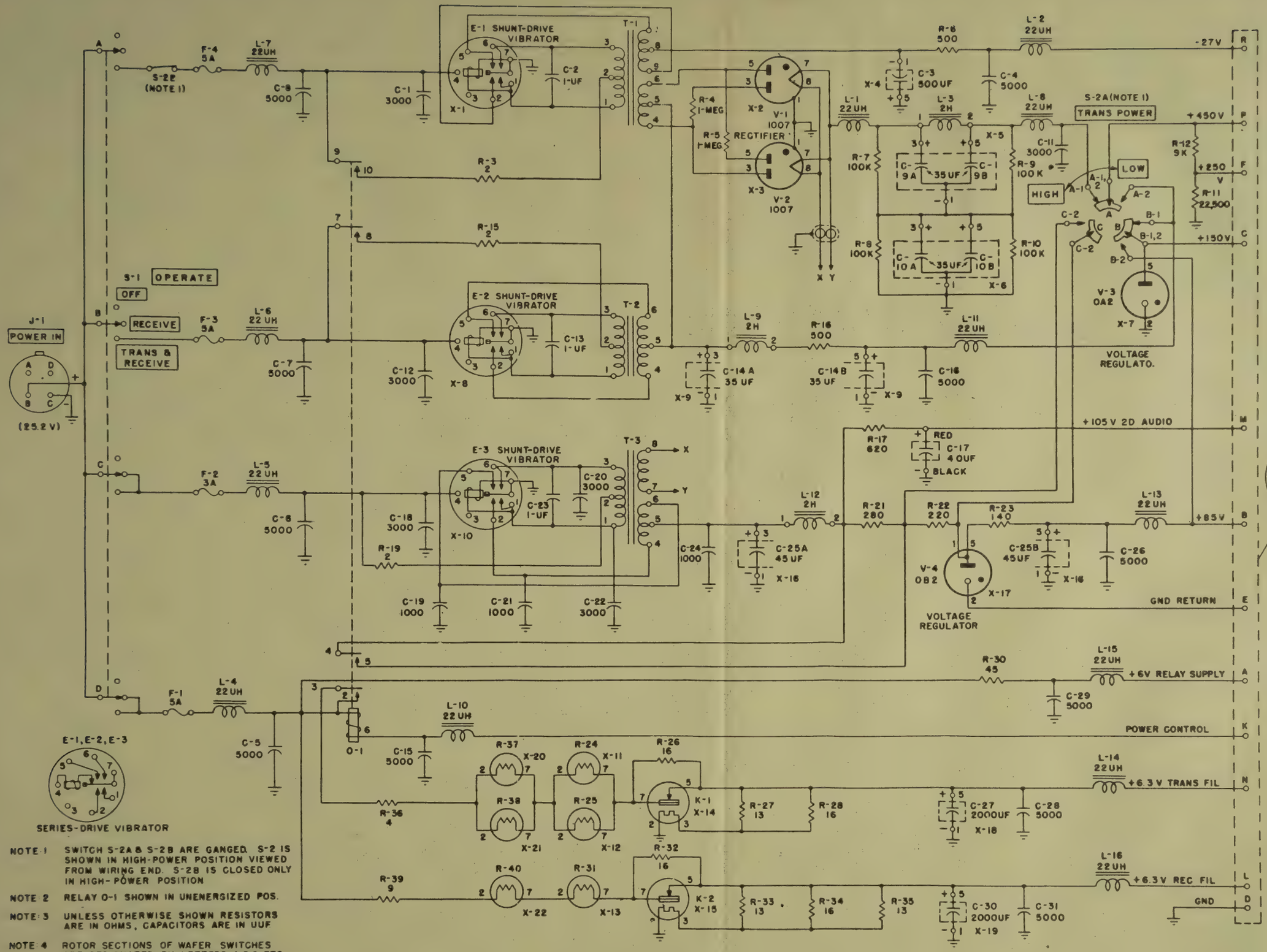
Radio Set AN/PRC-6, schematic diagram.

Army Ft McPherson Ga 976/52





6. *Set 1 filament circuit, schematic diagram.*



NOTE 1 SWITCH S-2A & S-2B ARE GANGED. S-2 IS SHOWN IN HIGH-POWER POSITION VIEWED FROM WIRING END. S-2B IS CLOSED ONLY IN HIGH-POWER POSITION

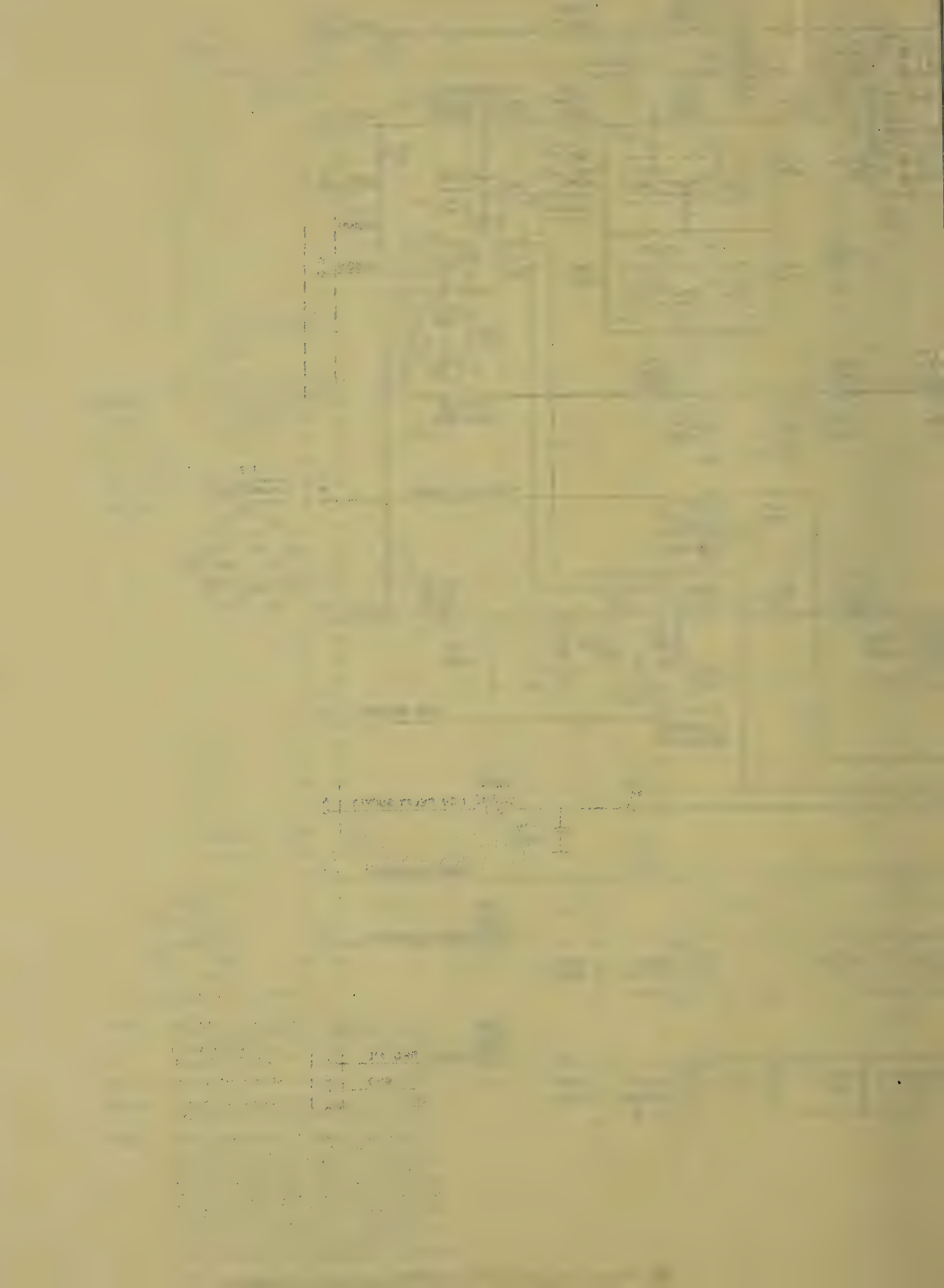
NOTE 2 RELAY O-1 SHOWN IN UNENERGIZED POS.

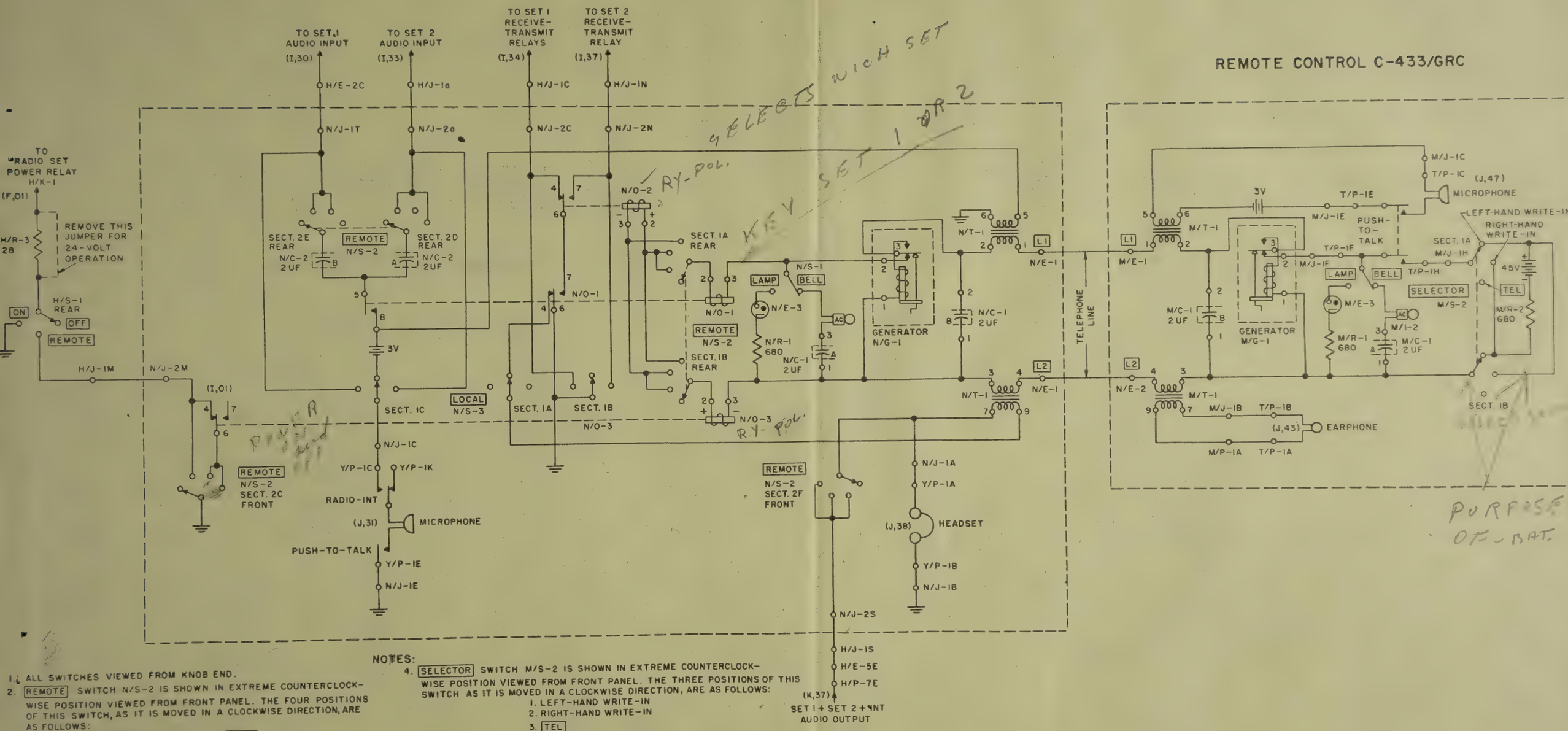
NOTE 3 UNLESS OTHERWISE SHOWN RESISTORS ARE IN OHMS, CAPACITORS ARE IN UUF

NOTE 4 ROTOR SECTIONS OF WAFER SWITCHES ARE DESIGNATED BY LETTERS A,B,C, ETC. CONTACTS ARE DESIGNATED BY A LETTER AND A NUMBER. THE LETTER INDICATES THE ROTOR SECTION THROUGH WHICH THE CONTACTS COMPLETE A CIRCUIT; THE NUMBER INDICATES THE SWITCH POSITION IN WHICH THE CONTACT IS IN A COMPLETED CIRCUIT. THE LETTERS AND NUMBERS DO NOT APPEAR ON THE EQUIPMENT BUT ARE USED ONLY ON SCHEMATIC DIAGRAMS.

NOTE 5 VOLTAGE READINGS ARE TAKEN UNDER NORMAL LOAD CONDITIONS.

4. *Power Supply PP–112/GR, schematic diagram.*

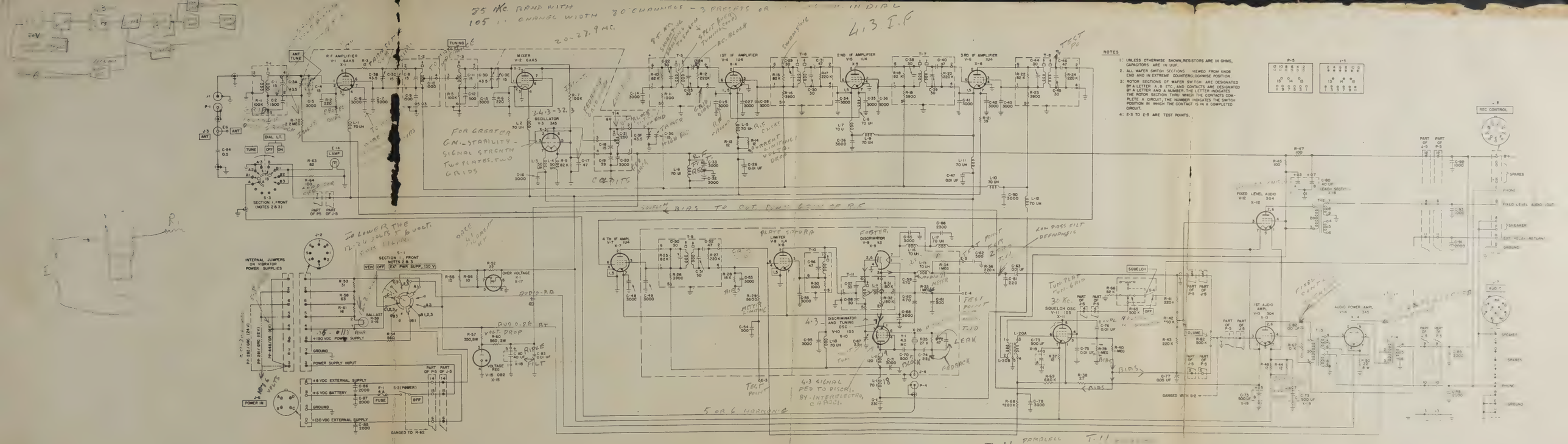




NOTES:

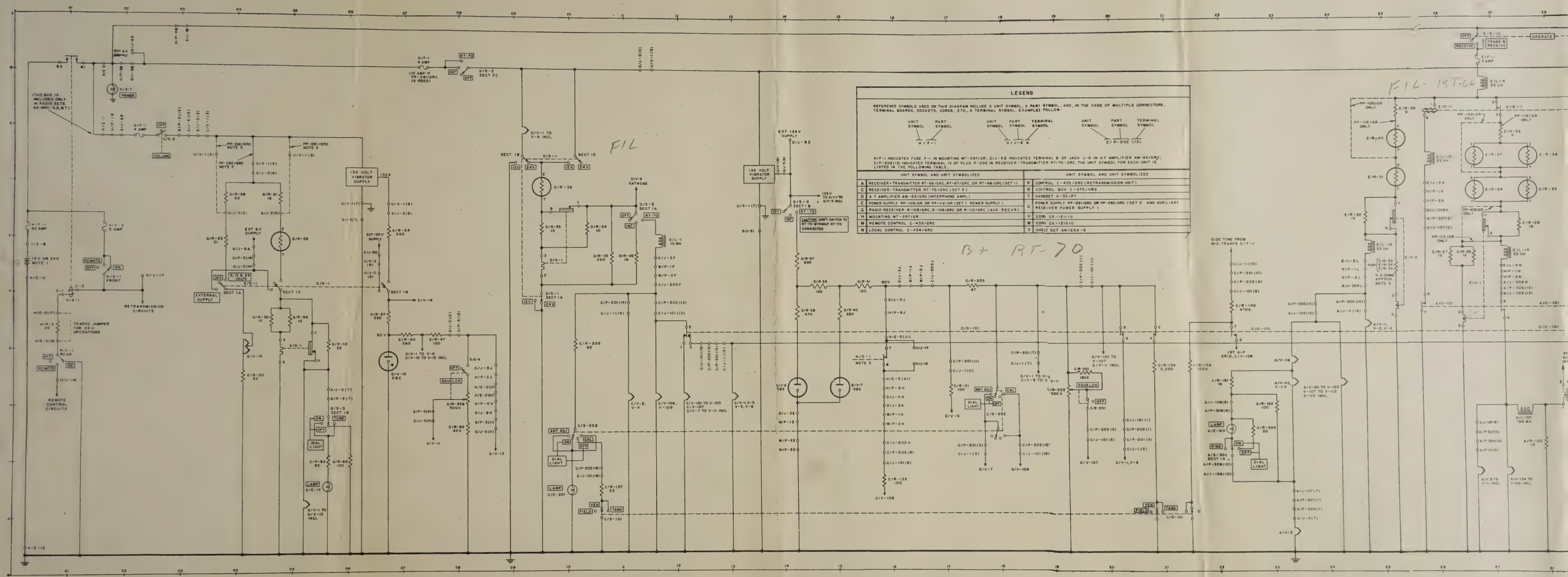
1. ALL SWITCHES VIEWED FROM KNOB END.
2. REMOTE SWITCH N/S-2 IS SHOWN IN EXTREME COUNTERCLOCKWISE POSITION VIEWED FROM FRONT PANEL. THE FOUR POSITIONS OF THIS SWITCH, AS IT IS MOVED IN A CLOCKWISE DIRECTION, ARE AS FOLLOWS:
   1. TEL ONLY
   2. SET 1 & 2
   3. SET 1
   4. SET 2
3. LOCAL SWITCH N/S-3 IS SHOWN IN CENTER POSITION. THE THREE POSITIONS OF THE SWITCH, AS IT IS MOVED IN A CLOCKWISE DIRECTION, ARE AS FOLLOWS:
   1. SET 1
   2. TEL
   3. SET 2
4. SELECTOR SWITCH M/S-2 IS SHOWN IN EXTREME COUNTERCLOCKWISE POSITION VIEWED FROM FRONT PANEL. THE THREE POSITIONS OF THIS SWITCH AS IT IS MOVED IN A CLOCKWISE DIRECTION, ARE AS FOLLOWS:
   1. LEFT-HAND WRITE-IN
   2. RIGHT-HAND WRITE-IN
   3. TEL
5. RELAY N/O-1 SHOWN IN UNENERGIZED POSITION.
6. RELAYS N/O-2 AND N/O-3 SHOWN AFTER APPLICATION OF A VOLTAGE WHICH MAKES TERMINAL 2 POSITIVE WITH RESPECT TO TERMINAL 3.
7. COORDINATES IN BRACKETS, SUCH AS (F,01) AT UPPER LEFT OF DIAGRAM, INDICATE LOCATION OF CIRCUIT ON THE MAIN SYSTEM CONTROL CIRCUIT WHICH CONTAINS THE LOCAL AND REMOTE CONTROL CIRCUITS.
8. UNLESS OTHERWISE SHOWN, RESISTORS ARE IN OHMS.

8. *Control group AN/GRA-6, schematic diagram.*

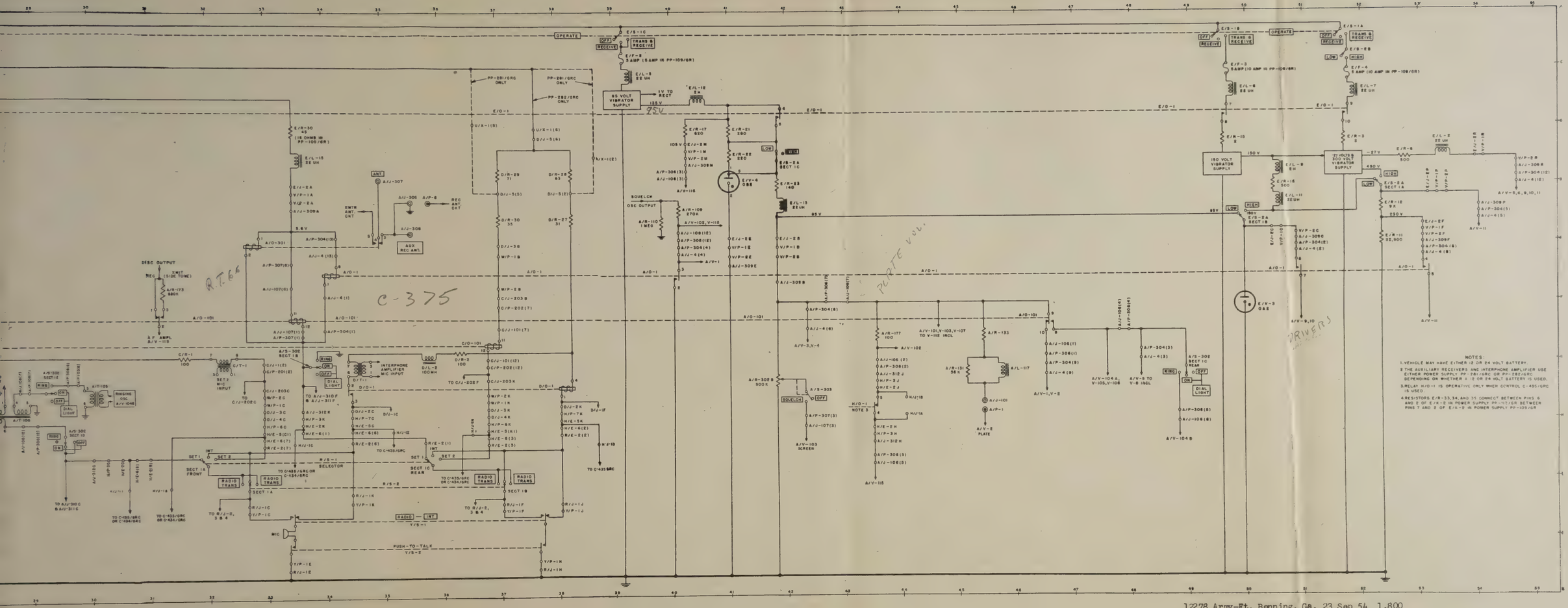

85 KC. BAND WIDTH
105 " CHANNEL WIDTH
20-27.9 MC.
4.3 I.F.
R.F. AMPLIFIER V-1 6AK5
MIXER V-2 6AK5
1ST IF AMPLIFIER V-4 1U4
2ND IF AMPLIFIER V-5 1U4
3RD IF AMPLIFIER V-6 1U4
4TH IF AMP. V-7 1U4
LIMITER V-8 1U4
DISCRIMINATOR V-9 1U4
OSCILLATOR V-3 3A5
SQUELCH OSC V-11 155
1ST AUDIO AMPL. V-13 3D4
AUDIO POWER AMPL. V-14
FIXED LEVEL AUDIO V-12
VOLT. REG V-15 OB2
OVER VOLTAGE X-17
VOLT. REG X-18
POWER SUPPLY INPUT
+6 VDC EXTERNAL SUPPLY
+6 VDC BATTERY
+130 VDC EXTERNAL SUPPLY
GROUND
SECTION I, FRONT (NOTES 2 & 3)
SECTION II, FRONT NOTES 2 & 3
INTERNAL JUMPERS ON VIBRATOR POWER SUPPLIES
TUNING
ANT TUNE
DIAL LT.
TUNE
OFF
ON
E-14 LAMP
VEH
EXT PWR SUPP, 130 V
BALLAST R-59 X-16
GANGED TO R-62
SQUELCH
VOLUME
REC CONTROL
SPARES
PHONE
FIXED LEVEL AUDIO (OUT)
SPEAKER
EXT RELAY RETURN
GROUND
SPEAKER
PHONE
GROUND
AUDIO-P.D.
BIAS TO CUT DOWN SQUELCH
TUNE PLATE AND GRID
30 KC.
4.3 SIGNAL FED TO DISCR. BY INTERELECTRO CAPACI.
5 OR 6 HARMONIC
PARALELL TUNED TO 4.35 MC.
NOTES
1: UNLESS OTHERWISE SHOWN, RESISTORS ARE IN OHMS, CAPACITORS ARE IN UUF.
2. ALL WAFER SWITCH SECTIONS VIEWED FROM KNOB END AND IN EXTREME COUNTERCLOCKWISE POSITION
3: MOTOR SECTIONS OF WAFER SWITCH ARE DESIGNATED BY A LETTER A, B ETC., AND CONTACTS ARE DESIGNATED BY A LETTER AND A NUMBER. THE LETTER INDICATES THE ROTOR SECTION THRU WHICH THE CONTACTS COMPLETE A CIRCUIT, THE NUMBER INDICATES THE SWITCH POSITION IN WHICH THE CONTACT IS IN A COMPLETED CIRCUIT.
4: E-3 TO E-5 ARE TEST POINTS.

Radio Receiver R-108/GRC, Schematic Diagram

12278 Army-Ft. Benning, Ga. 23 Sep 54 1,800

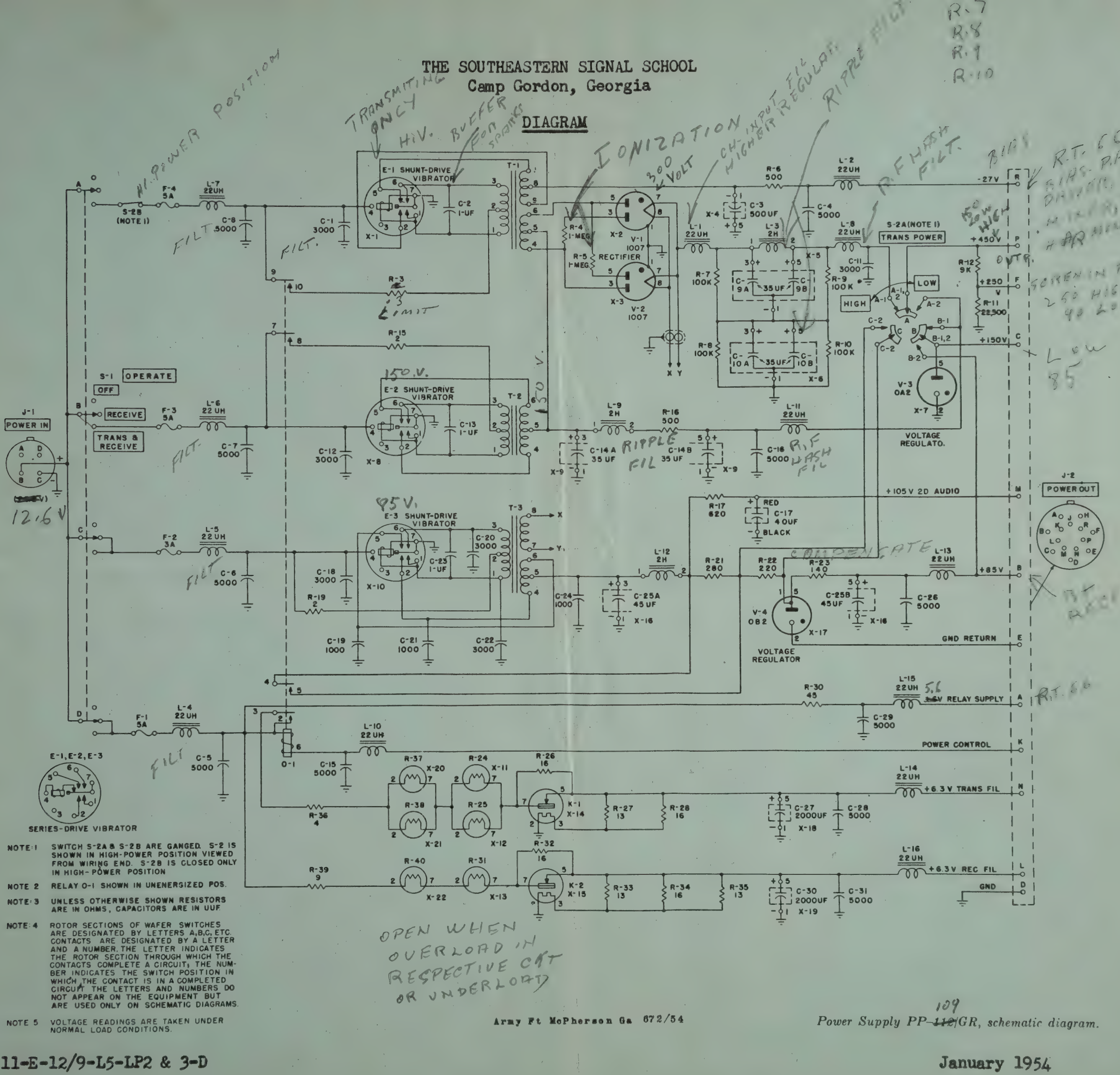

LEGEND
REFERENCE SYMBOLS USED ON THIS DIAGRAM INCLUDE A UNIT SYMBOL, A PART SYMBOL, AND, IN THE CASE OF MULTIPLE CONNECTORS, TERMINAL BOARDS, SOCKETS, CORDS, ETC., A TERMINAL SYMBOL. EXAMPLES FOLLOW:
UNIT SYMBOL
PART SYMBOL
TERMINAL SYMBOL
M/F-1
D/J-6 B
C/P-202 (13)
M/F-1 INDICATES FUSE F-1 IN MOUNTING MT-297/GR; D/J-6B INDICATES TERMINAL B OF JACK J-6 IN A.F AMPLIFIER AM-65/GRC; C/P-202(13) INDICATES TERMINAL 13 OF PLUG P-202 IN RECEIVER-TRANSMITTER RT-70-GRC. THE UNIT SYMBOL FOR EACH UNIT IS LISTED IN THE FOLLOWING TABLE.
UNIT SYMBOL AND UNIT SYMBOLIZED
A RECEIVER-TRANSMITTER RT-66/GRC, RT-67/GRC, OR RT-68/GRC (SET 1)
C RECEIVER-TRANSMITTER RT-70/GRC (SET 2)
D A F AMPLIFIER AM-65/GRC (INTERPHONE AMPL)
E POWER SUPPLY PP-109/GR OR PP-112/GR (SET 1 POWER SUPPLY)
G RADIO RECEIVER R-108/GRC, R-109/GRC OR R-110/GRC (AUX RECVR)
H MOUNTING MT-297/GR
M REMOTE CONTROL C-433/GRC
N LOCAL CONTROL C-434/GRC
P CONTROL C-435/GRC (RETRANSMISSION UNIT)
R CONTROL BOX C-375/VRC
T HANDSET H-33/PT
U POWER SUPPLY PP-281/GRC OR PP-282/GRC (SET 2 AND AUXILIARY RECEIVER POWER SUPPLY)
V CONT CX-1211/U
W CONT CX-1213/U
Y CHEST SET AN/GSA-6
CAUTION! DON'T SWITCH TO RT-70 WITHOUT RT-70 CONNECTED
B+ RT-70
FIL
FIL- RT-68
THIS BUS IS INCLUDED ONLY IN RADIO SETS AN/GRC-3,4,&7
REMOVE JUMPER FOR 24 V OPERATIONS
RETRANSMISSION CIRCUITS
REMOTE CONTROL CIRCUITS
SIDE TONE FROM MIC TRANS C/T-1
135 VOLT VIBRATOR SUPPLY
EXT 135V SUPPLY
EXT 6V SUPPLY
EXT 130V SUPPLY
EXTERNAL SUPPLY
6, 12 & 24 VOLTS
VOLUME
SQUELCH
ANT ADJ
DIAL LIGHT
TUNE
LAMP
RING
VEH
TANK
FIELD
OPERATE
RECEIVE
TRANS & RECEIVE
1ST A-F GRID, C/V-106
A/V-1, V-2, V-4
A/V-101 TO V-103
V-107 TO V-112
V-115 INCL
A/V-104 TO V-106 INCL
A/V-570 V-111 INCL

Radio Sets AN/GRC 3-8 - Pow


OPERATE
OFF
TRANS & RECEIVE
RECEIVE
85 VOLT VIBRATOR SUPPLY
150 VOLT VIBRATOR SUPPLY
27-VOLT & 300 VOLT VIBRATOR SUPPLY
HIGH
LOW
DISC OUTPUT
XMIT (SIDE TONE)
REC
A/R-173 680K
A.F. AMPL A/V-115
A/J-307
A/J-306
A/P-8
REC ANT. CKT
XMTR ANT. CKT
AUX REC ANT.
PP-281/GRC ONLY
PP-282/GRC ONLY
SQUELCH
OSC OUTPUT
A/R-109 270K
A/R-110 1MEG
A/V-102, V-115
A/V-116
A/V-4
A/V-3, V-4
A/R-302 B 500 K
A/S-303
A/J-101
A/P-1
A/V-2 PLATE
A/V-103 SCREEN
A/R-177 100
A/V-101, V-103, V-107 TO V-115 INCL
A/R-133
A/R-131 58 K
A/L-117
A/V-104 A, V-105, V-106
A/V-5 TO V-8 INCL
A/V-104 B
A/V-1, V-2
A/V-9, 10
A/V-11
A/V-12
A/V-13
A/V-118
A/P-304(8)
A/J-4(8)
A/J-106(1)
A/P-304(1)
A/P-304(9)
A/J-4(9)
A/P-304(3)
A/J-4(3)
A/P-306(8)
A/J-108(8)
A/J-106(2)
A/P-306(2)
A/J-312 J
A/P-3 J
A/R-E 2 J
A/J-106(3)
A/P-306(5)
A/J-106(5)
M-J-1A
M-J-1B
H/J-1 NOTE 3
A/S-302 SECT 1C REAR
A/S-302 SECT 1B
A/S-302 SECT 1A FRONT
A/S-302 SECT 1E
A/S-302 SECT 1D
RING
ON
OFF
DIAL LIGHT
RINGING 556 A/V-104B
A/T-105
A/T-106
A/P-306(1)
A/J-108(1)
A/P-306(3)
A/J-108(3)
C/J-1(2)
C/P-201(2)
C/J-203C
W/P-2C
W/P-1C
D/J-3C
D/J-4C
H/P-6C
W/E-5(C1)
W/E-6(7)
OR/E-2(7)
C/R-1 100
C/T-1 30:01
SET 2 MIC INPUT
TO C/J-202C
INTERPHONE AMPLIFIER MIC INPUT
D/T-1
TO A/J-310 F & A/J-311 F
D/L-2 100 MW
D/R-2 100
TO C/J-202 F
C/J-101(12)
C/P-202(12)
C/J-203 K
C/J-101(7)
C/P-202(7)
W/P-2 K
W/P-1 K
D/J-2 K
D/J-4 K
H/P-6 K
W/E-5(K1)
W/E-6(3)
OR/E-2(3)
D/J-2C
W/P-7C
W/E-5C
W/E-6(2)
OR/E-2(2)
D/J-1F
M-J-1D
TO C-435/GRC
TO C-435/GRC OR C-434/GRC
R/S-1 SELECTOR
R/S-2
SET 1
SET 2
INT
SECT 1A
SECT 1B
SECT 1C
RADIO TRANS
TO A/J-310 C & A/J-311 C
TO C-435/GRC OR C-434/GRC
TO R/J-2, 3 & 4
R/J-1C
Y/P-1C
R/J-1K
Y/P-1K
R/J-1F
Y/P-1F
R/J-1J
Y/P-1J
RADIO — INT
Y/S-1
MIC
PUSH-TO-TALK
Y/S-2
Y/P-1E
R/J-1E
Y/P-1H
R/J-1H
E/S-1C
E/F-2 5 AMP (5 AMP IN PP-109/GR)
E/L-9 2Z UH
1V TO RECT
135 V
25V
E/R-17 820
E/R-21 280
E/R-22 220
E/V-4 OA8
E/L-13 2Z UH
E/R-23 140
E/J-2E
V/P-1E
V/P-2E
A/J-309E
A/J-309B
A/P-304(7)
A/J-106(7)
E/S-1B
E/F-3 5 AMP (10 AMP IN PP-108/GR)
E/L-6 2Z UH
E/F-4 5 AMP (10 AMP IN PP-109/GR)
E/L-7 2Z UH
E/R-15
E/R-3
E/R-16 500
E/L-8 5H
E/L-11 2Z UH
E/R-18 9K
E/R-11 22,500
E/S-2A SECT 1A
E/S-2B SECT 1B
E/V-3 OA2
E/V-9, 10
E/R-6 500
E/L-2 2Z UH
E/J-2F
V/P-1F
V/P-2F
A/J-309F
A/P-304(6)
A/J-4(6)
A/J-309P
A/P-304(5)
A/J-4(5)
A/J-309R
A/P-304(12)
A/J-4(12)
A/V-5, 6, 7, 8, 10, 11
A/V-11
E/R-30 45
E/L-15 2Z UH
E/J-2A
V/P-1A
V/P-2A
A/J-309A
5.6 V
A/P-304(13)
A/J-4(13)
A/P-307(6)
A/J-107(6)
A/J-107(1)
A/P-307(1)
A/P-304(1)
A/J-4(1)
D/R-29 71
D/R-30 35
D/R-38 83
D/R-27 31
D/J-5(5)
D/J-5(E)
D/J-3B
W/P-1B
W/P-2B
C/J-203B
C/P-202(7)
C/J-101(7)
U/X-1(5)
U/X-1(6)
D/J-5(6)
U/X-1(2)
E/O-1
A/O-1
A/O-101
A/O-301
A/S-302 SECT 1B
A/S-302 SECT 1E
A/S-302 SECT 1D
A/S-302 SECT 1C REAR
A/S-302 SECT 1A FRONT
A/S-302 SECT 1B
A/S-302 SECT 1C REAR
A/S-303
E/S-2A SECT 1A
E/S-2B SECT 1B
E/S-1A
E/S-1B
E/S-1C
E/S-2
E/S-2B
E/S-1B
E/S-1A
E/F-2
E/F-3
E/F-4
E/F-6
E/F-7
E/F-8
E/R-2 820
E/R-3
E/R-6
E/R-11
E/R-15
E/R-16
E/R-17
E/R-18
E/R-21
E/R-22
E/R-23
E/R-30
E/R-38
E/V-3
E/V-4
E/V-9, 10
E/V-11
E/V-12
E/V-13
A/V-5, 6, 7, 8, 10, 11
A/V-11
A/V-12
A/V-13
A/V-118
A/V-1
A/V-2
A/V-3, V-4
A/V-9, 10
A/V-11
A/V-102, V-115
A/V-116
A/V-101, V-103, V-107 TO V-115 INCL
A/V-104 A, V-105, V-106
A/V-5 TO V-8 INCL
A/V-104 B
A/V-1, V-2
A/V-103 SCREEN
A/V-2 PLATE
A/V-9, 10
A/V-11
A/V-12
A/V-13
A/V-118
A/J-307
A/J-306
A/P-8
A/J-308
A/J-4(1)
A/J-4(13)
A/J-4(8)
A/J-4(9)
A/J-4(3)
A/J-4(12)
A/J-4(6)
A/J-4(5)
A/J-101
A/J-107(1)
A/J-307(1)
A/J-107(6)
A/J-307(3)
A/J-107(3)
A/J-106(1)
A/J-106(2)
A/J-106(3)
A/J-108(1)
A/J-108(3)
A/J-108(8)
A/J-309A
A/J-309B
A/J-309E
A/J-309F
A/J-309P
A/J-309R
A/J-312 J
A/J-312 K
A/J-310 F
A/J-311 F
A/P-301
A/P-304(13)
A/P-307(6)
A/P-304(1)
A/P-304(8)
A/P-304(9)
A/P-304(3)
A/P-304(12)
A/P-304(5)
A/P-306(1)
A/P-306(2)
A/P-306(3)
A/P-306(5)
A/P-306(8)
A/P-3 J
A/P-304(6)
A/P-1
A/P-8
A/R-109 270K
A/R-110 1MEG
A/R-131 58 K
A/R-133
A/R-173 680K
A/R-177 100
A/R-302 B 500 K
A/T-105
A/T-106
C/J-1(2)
C/P-201(2)
C/J-203C
C/J-203K
C/J-101(12)
C/P-202(12)
C/J-101(7)
C/P-202(7)
C/J-203B
C/P-202F
C/R-1 100
C/R-2 100
C/T-1 30:01
D/J-1F
D/J-2C
D/J-2K
D/J-3C
D/J-3K
D/J-4C
D/J-4K
D/J-5(5)
D/J-5(6)
D/J-5(E)
D/L-2 100 MW
D/R-29 71
D/R-30 35
D/R-38 83
D/R-27 31
D/T-1
H/J-1A
H/J-1B
H/J-1C
H/J-1D
H/J-1E
H/J-1F
H/J-1G
H/J-1H
H/J-1J
H/J-1K
H/P-6C
H/P-6K
M-J-1A
M-J-1B
M-J-1D
OR/E-2(2)
OR/E-2(3)
OR/E-2(7)
R/J-1C
R/J-1E
R/J-1F
R/J-1H
R/J-1J
R/J-1K
R/S-1
R/S-2
U/X-1(2)
U/X-1(5)
U/X-1(6)
W/E-5(C1)
W/E-5C
W/E-5(K1)
W/E-6(1)
W/E-6(2)
W/E-6(3)
W/E-6(7)
W/P-1B
W/P-1C
W/P-1K
W/P-2B
W/P-2C
W/P-2K
W/P-7C
Y/P-1C
Y/P-1E
Y/P-1F
Y/P-1H
Y/P-1J
Y/P-1K
Y/S-1
Y/S-2
RADIO TRANS
RADIO — INT
SET 1
SET 2
INT
SECT 1A
SECT 1B
SECT 1C
SECT 1A FRONT
SECT 1C REAR
SECT 1D
SECT 1E
RING
ON
OFF
DIAL LIGHT
RINGING 556 A/V-104B
INTERPHONE AMPLIFIER MIC INPUT
SET 2 MIC INPUT
SELECTOR
PUSH-TO-TALK
MIC
TO C-435/GRC OR C-434/GRC
TO A/J-310 C & A/J-311 C
TO A/J-310 F & A/J-311 F
TO C/J-202C
TO C/J-202 F
TO R/J-2, 3 & 4
TO C-435/GRC
TO C-435/GRC OR C-434/GRC
TO C-435 GRC
PP-281/GRC ONLY
PP-282/GRC ONLY
ANT
XMTR ANT. CKT
REC ANT. CKT
AUX REC ANT.
DISC OUTPUT
XMIT (SIDE TONE)
A.F. AMPL A/V-115
SQUELCH
OSC OUTPUT
A/V-102, V-115
A/V-116
A/V-4
A/V-3, V-4
A/V-103 SCREEN
A/V-2 PLATE
A/V-104 A, V-105, V-106
A/V-5 TO V-8 INCL
A/V-104 B
A/V-1, V-2
A/V-9, 10
A/V-11
A/V-118
A/O-1
A/O-101
A/O-301
E/O-1
E/S-1C
E/S-1B
E/S-1A
E/S-2
E/S-2B
E/S-2A SECT 1A
E/S-2B SECT 1B
E/F-2
E/F-3
E/F-4
E/F-6
E/F-7
E/F-8
E/R-2
E/R-3
E/R-6
E/R-11
E/R-15
E/R-16
E/R-17
E/R-18
E/R-21
E/R-22
E/R-23
E/R-30
E/R-38
E/V-3
E/V-4
E/V-9, 10
E/V-11
E/V-12
E/V-13

THE SOUTHEASTERN SIGNAL SCHOOL
Camp Gordon, Georgia

DIAGRAM



NOTE 1 SWITCH S-2A & S-2B ARE GANGED. S-2 IS SHOWN IN HIGH-POWER POSITION VIEWED FROM WIRING END. S-2B IS CLOSED ONLY IN HIGH-POWER POSITION

NOTE 2 RELAY O-1 SHOWN IN UNENERGIZED POS.

NOTE 3 UNLESS OTHERWISE SHOWN RESISTORS ARE IN OHMS, CAPACITORS ARE IN UUF.

NOTE 4 ROTOR SECTIONS OF WAFER SWITCHES ARE DESIGNATED BY LETTERS A,B,C, ETC. CONTACTS ARE DESIGNATED BY A LETTER AND A NUMBER. THE LETTER INDICATES THE ROTOR SECTION THROUGH WHICH THE CONTACTS COMPLETE A CIRCUIT; THE NUMBER INDICATES THE SWITCH POSITION IN WHICH THE CONTACT IS IN A COMPLETED CIRCUIT. THE LETTERS AND NUMBERS DO NOT APPEAR ON THE EQUIPMENT BUT ARE USED ONLY ON SCHEMATIC DIAGRAMS.

NOTE 5 VOLTAGE READINGS ARE TAKEN UNDER NORMAL LOAD CONDITIONS.

OPEN WHEN OVERLOAD IN RESPECTIVE CKT OR UNDERLOAD

Army Ft McPherson Ga 672/54

109

Power Supply PP-~~112~~/GR, schematic diagram.

11-E-12/9-L5-LP2 & 3-D

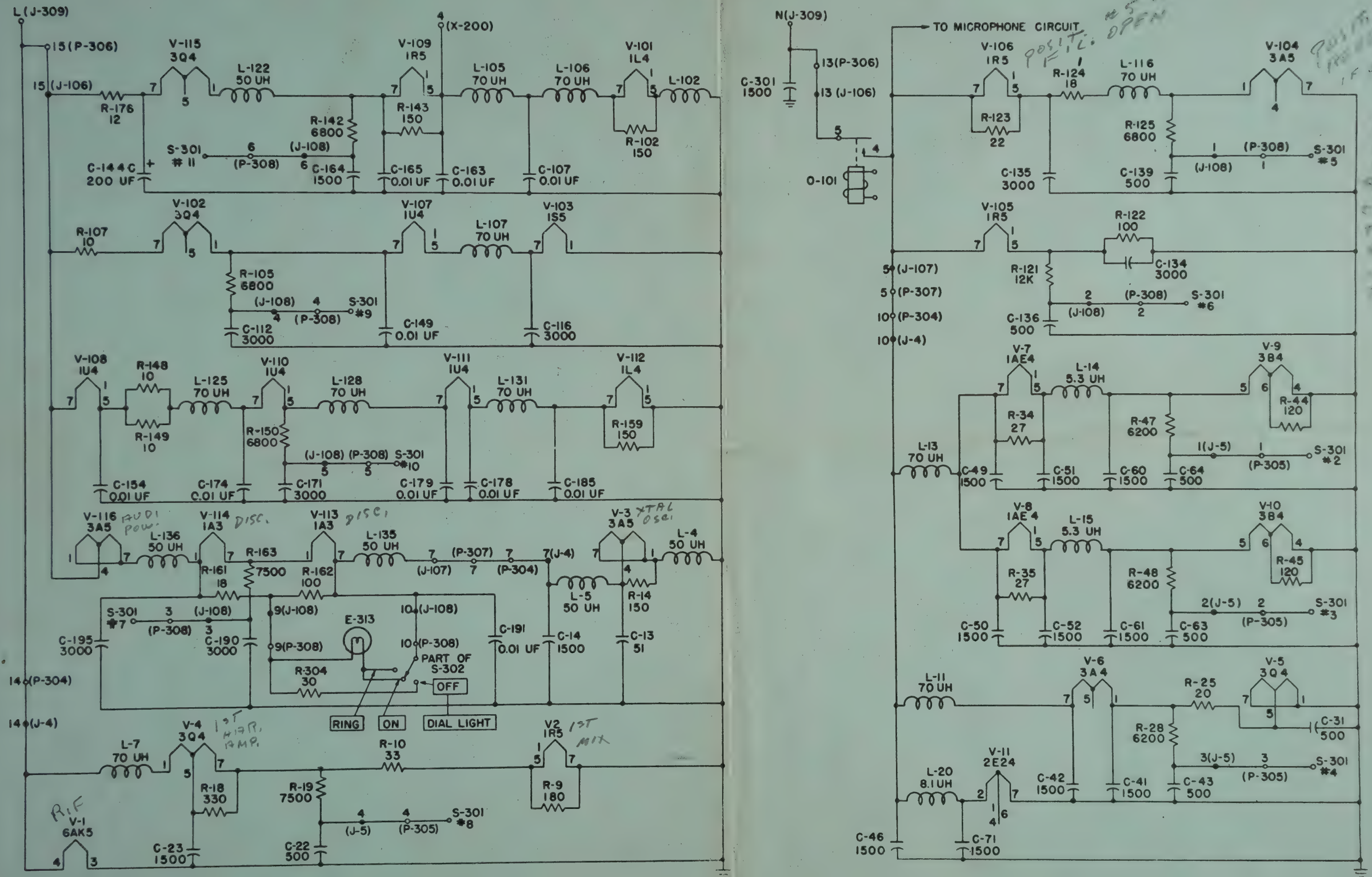
January 1954

RECEI. FILAMENTS

THE SOUTHEASTERN SIGNAL SCHOOL
Camp Gordon, Georgia

TRANS. FILAMENTS

DIAGRAM



Set 1 filament circuit, schematic diagram.

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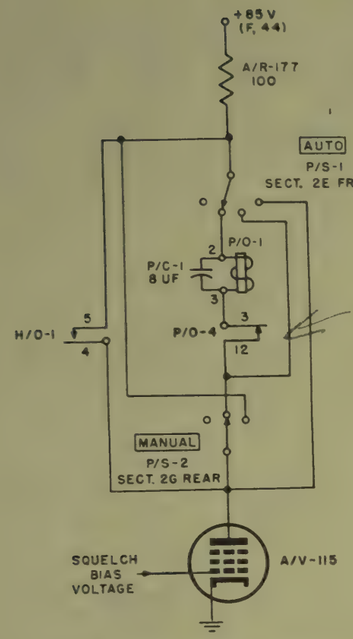
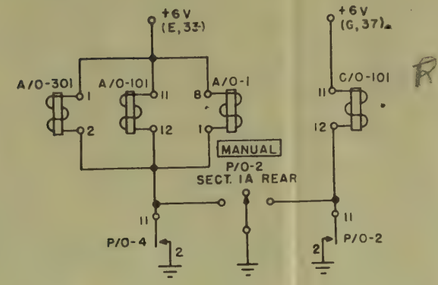
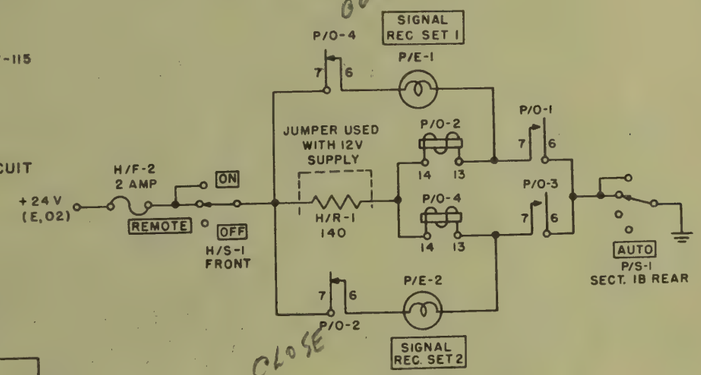


A SET 1
PRIMARY RELAY CIRCUIT

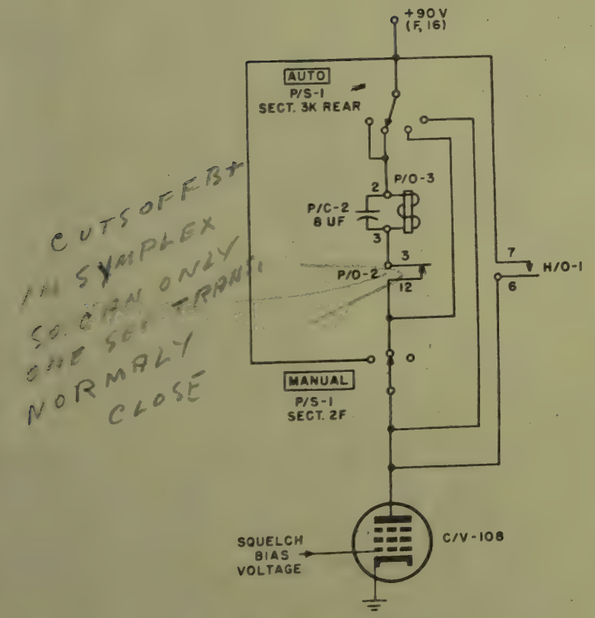


D SET 1
RECEIVE-TRANSMIT
RELAY CIRCUIT

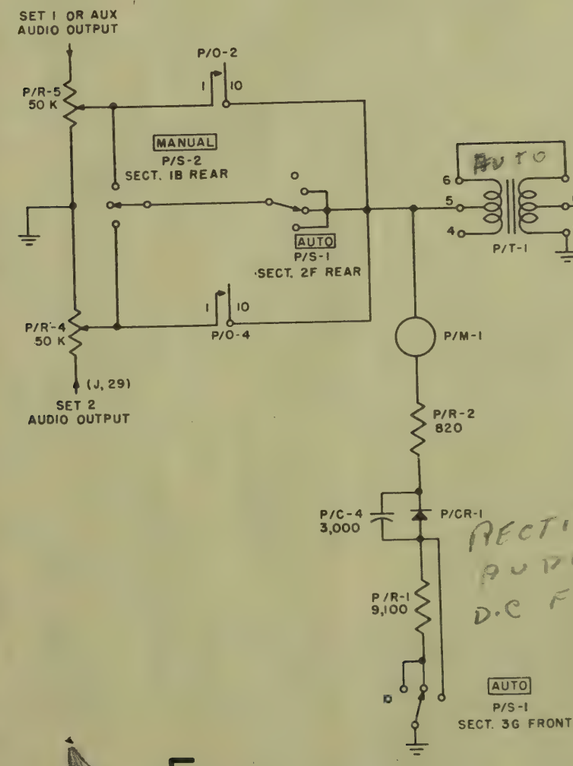
SET 2
RECEIVE-TRANSMIT
RELAY CIRCUIT



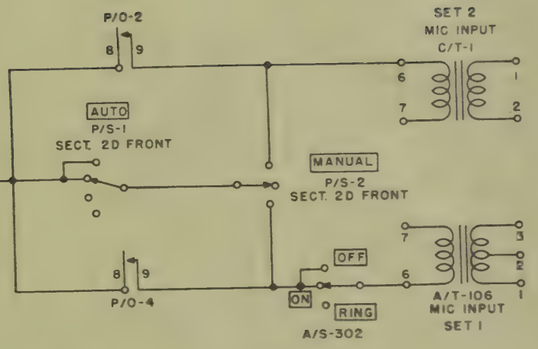
C SET 1 AND SET 2
SECONDARY RELAY AND LAMP CIRCUITS



B SET 2
PRIMARY RELAY CIRCUIT



E AUDIO RETRANSMISSION CIRCUITS



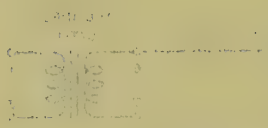
NOTES:

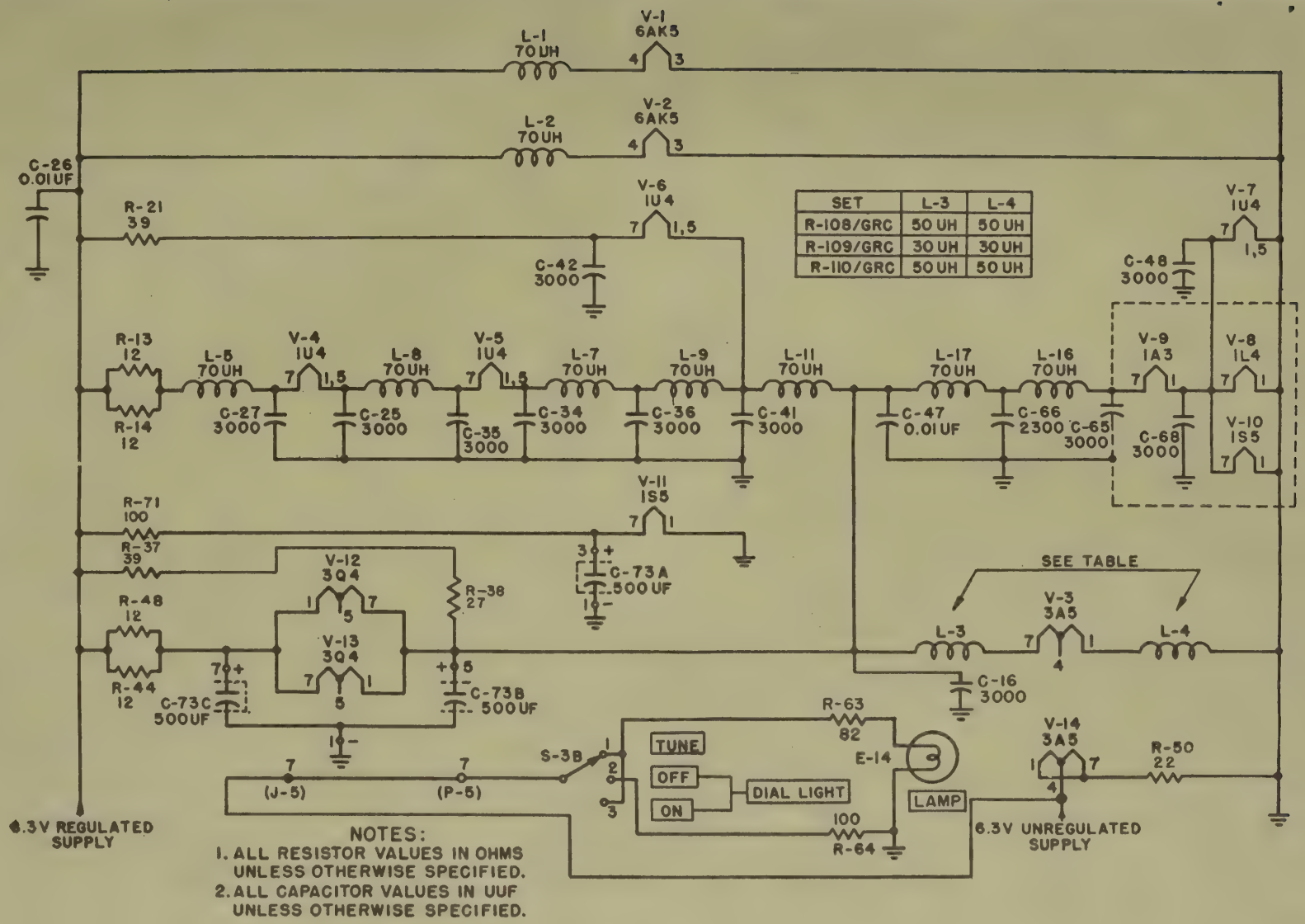
1. AUTO SWITCH P/S-1 HAS FOUR POSITIONS. THE SWITCH IS SHOWN IN THE RETRANS POSITION. THE FOUR POSITIONS ARE IDENTIFIED IN A CLOCKWISE DIRECTION AS FOLLOWS:
   1. OFF
   2. DUPLEX
   3. RETRANS
   4. ADJUST METER
2. MANUAL SWITCH P/S-2 HAS THREE POSITIONS. THE SWITCH IS SHOWN IN THE INT POSITION. THE THREE POSITIONS ARE IDENTIFIED IN A CLOCKWISE DIRECTION AS FOLLOWS:
   1. SEND SET 1
   2. INT
   3. SEND SET 2
3. COORDINATES IN BRACKETS, SUCH AS (F,44) IN SECTION A, INDICATE LOCATION OF CIRCUIT ON THE MAIN SYSTEM CONTROL CIRCUIT WHICH CONTAINS THE RETRANSMISSION UNIT CIRCUITS.
4. CONTACTS OF ALL RELAYS EXCEPT THOSE OF H/O-1 ARE SHOWN IN UNENERGIZED CONDITION OF RELAYS.
5. UNLESS OTHERWISE SHOWN; RESISTORS ARE IN OHMS, CAPACITORS ARE IN UUF.

TWO MODES OF RETRANS:

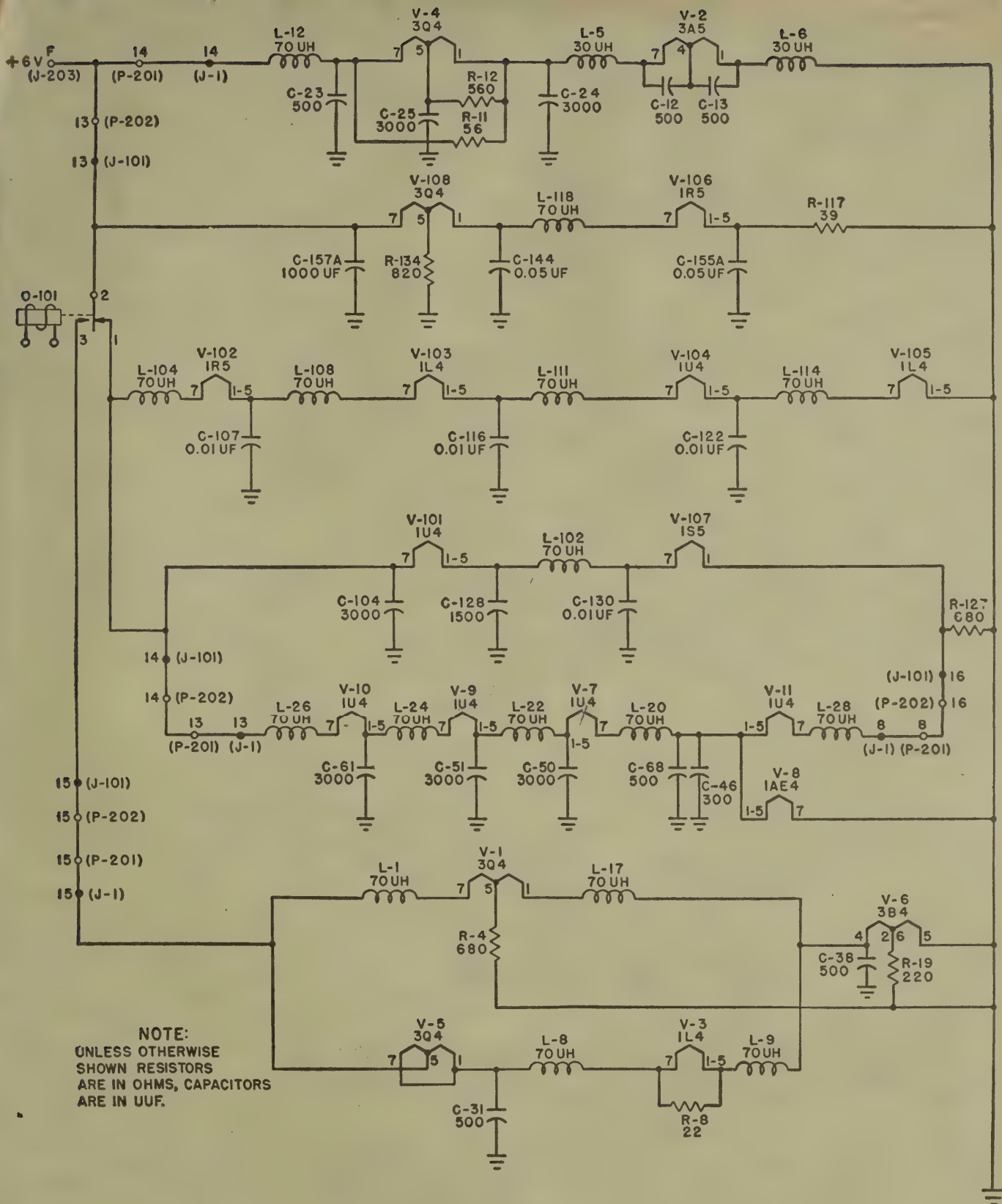
1- DUPLEX - REC. TRANS. SIMULTANEOUS

2- SYMPLEX.





10. Radio Receiver R-108/GRC, Filament Circuit



11. Receiver-Transmitter RT-66/GRC, Filament Circuit

THE SOUTHEASTERN SIGNAL SCHOOL
Camp Gordon, Georgia

DIAGRAM

SCHEMATIC DIAGRAMS

for

AN/GRC 26-A

(11-E-12/7-L6)

11-E-12/7-L6-D
11-E-17/12- D

April 1953

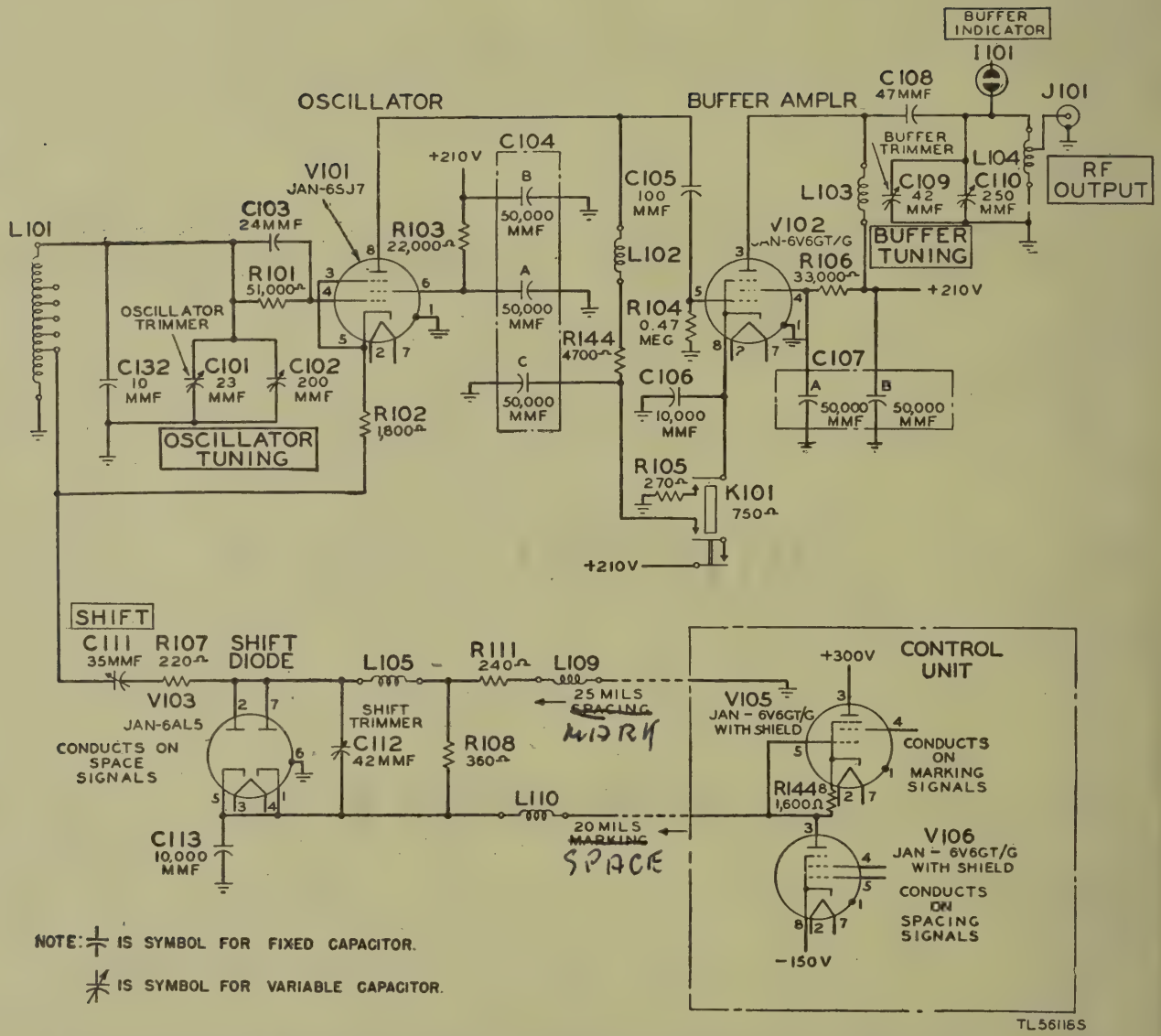


Figure 18. Frequency shift exciter oscillator, amplifier, and keying circuit, simplified schematic diagram.

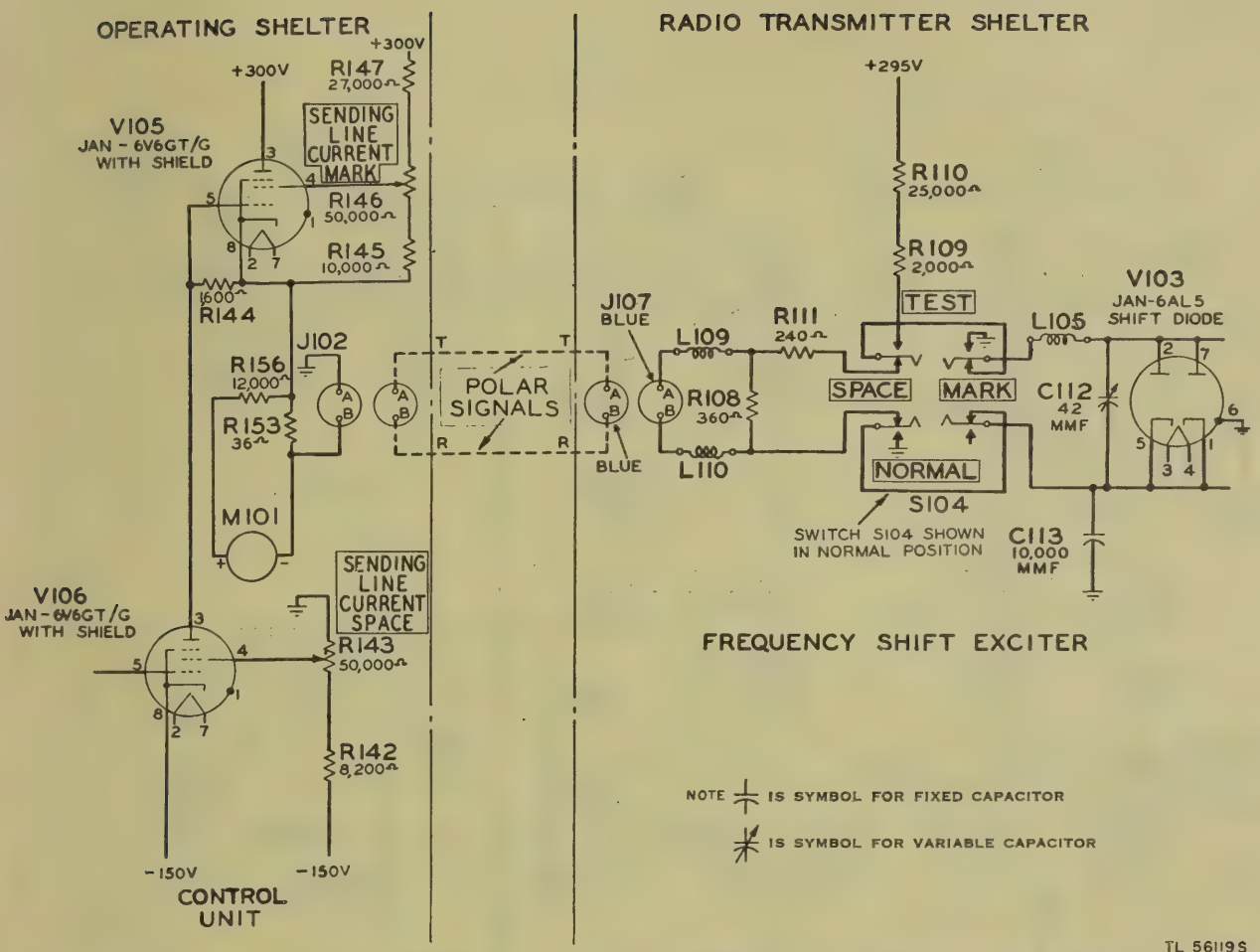


Figure 19. Connection of control unit to frequency shift exciter, simplified schematic diagram.

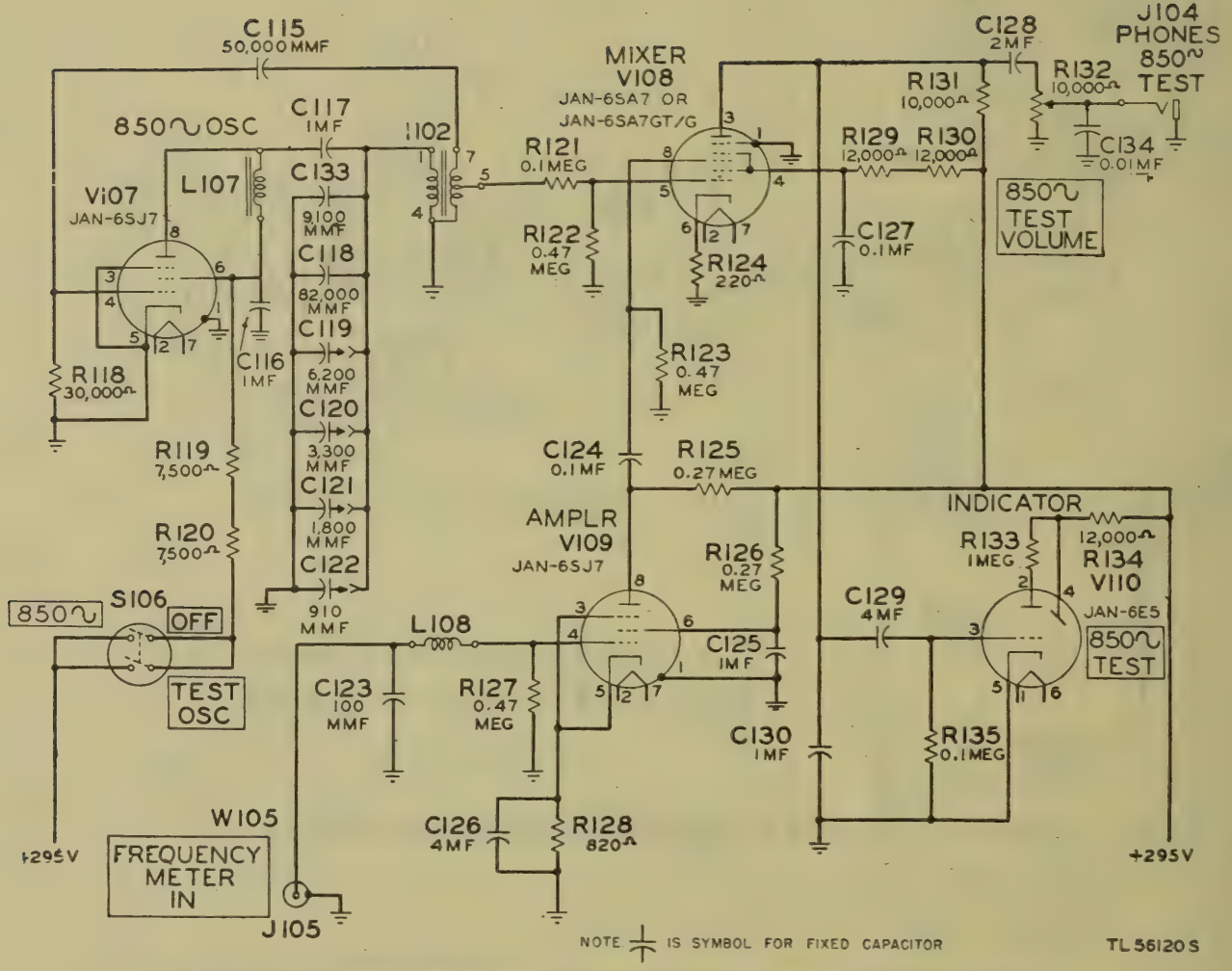


Figure 20. Frequency shift exciter monitoring circuit, simplified schematic diagram.

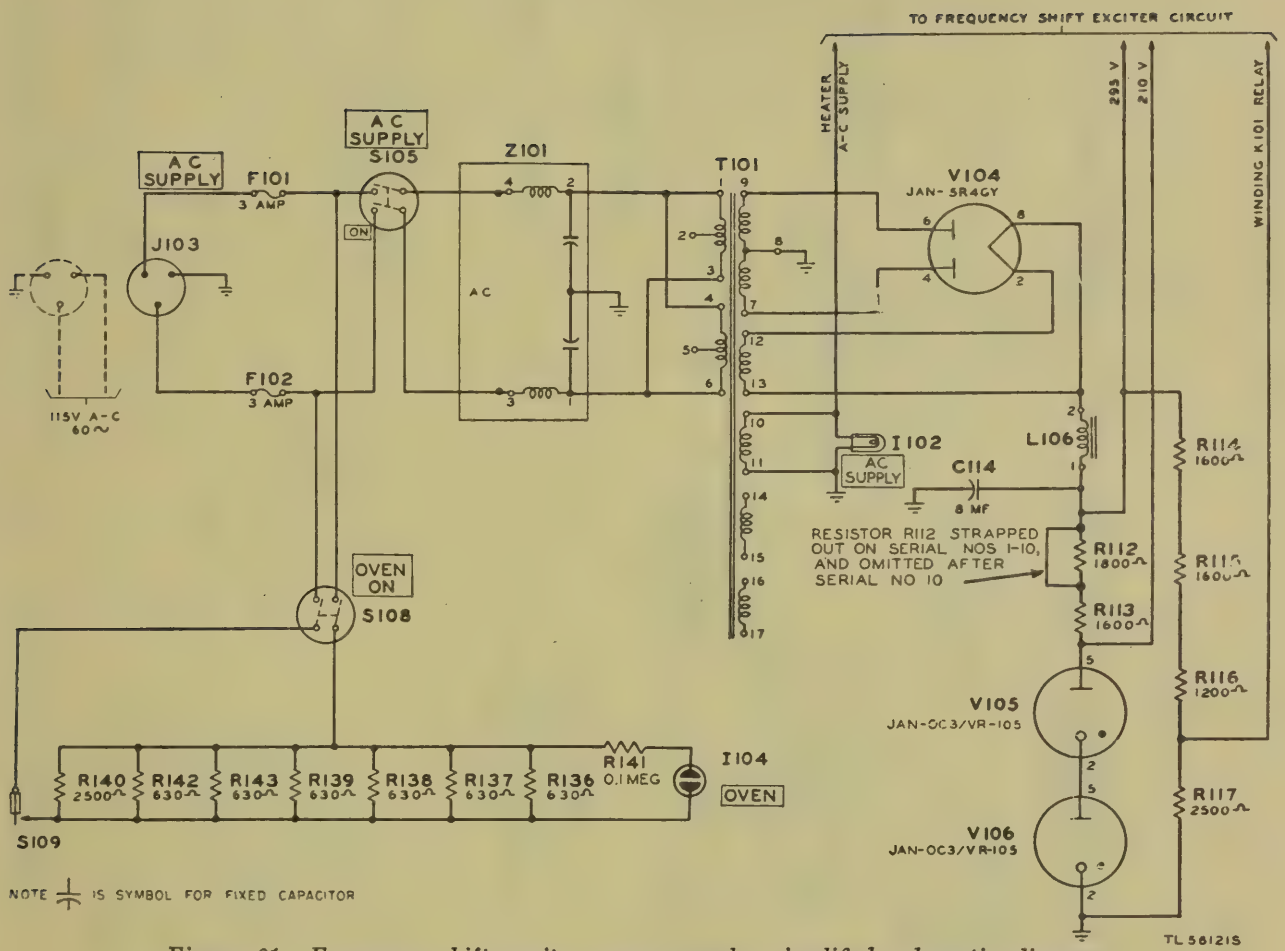


Figure 21. Frequency shift exciter power supply, simplified schematic diagram.

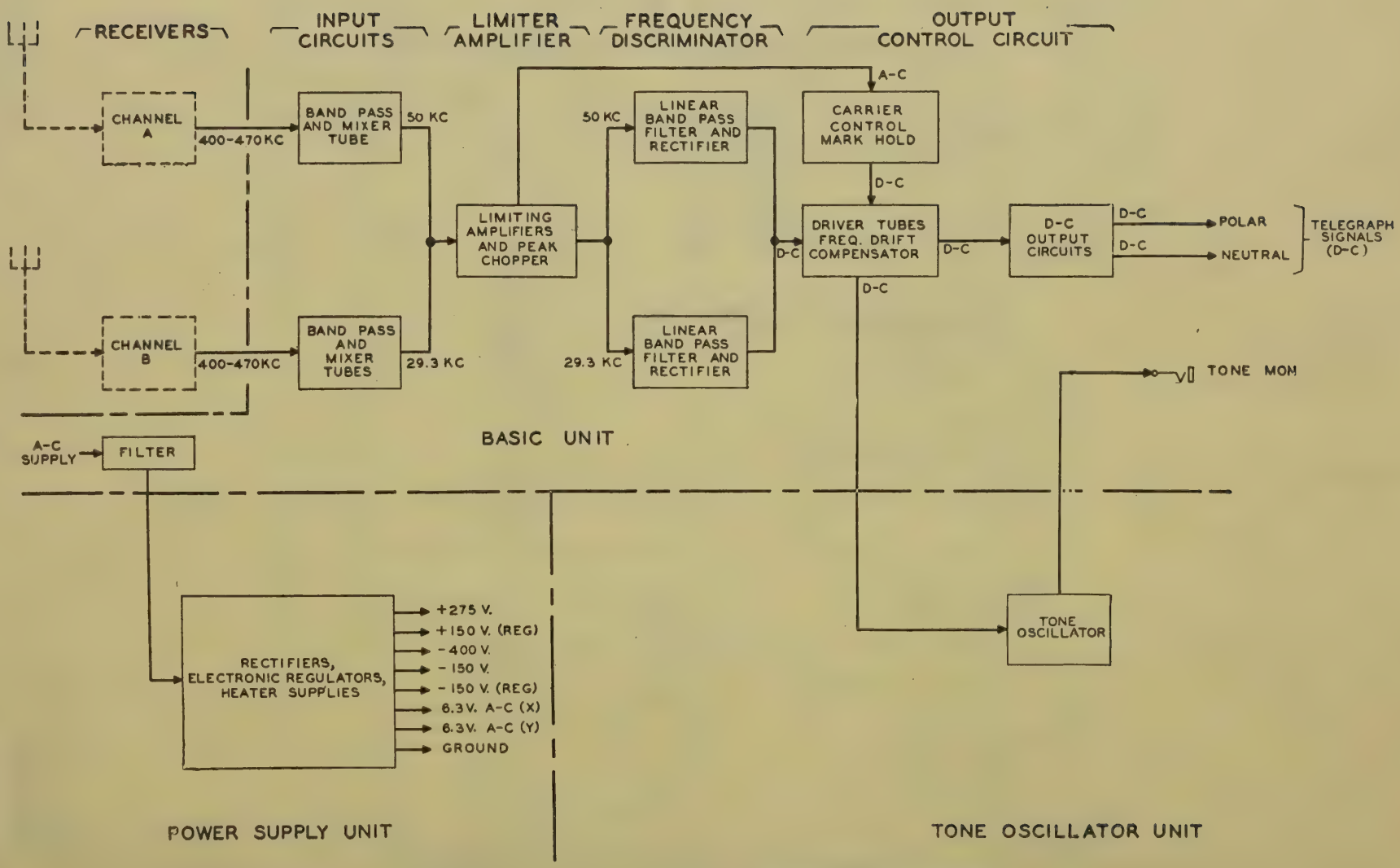


Figure 22. Dual diversity converter, functional block diagram.

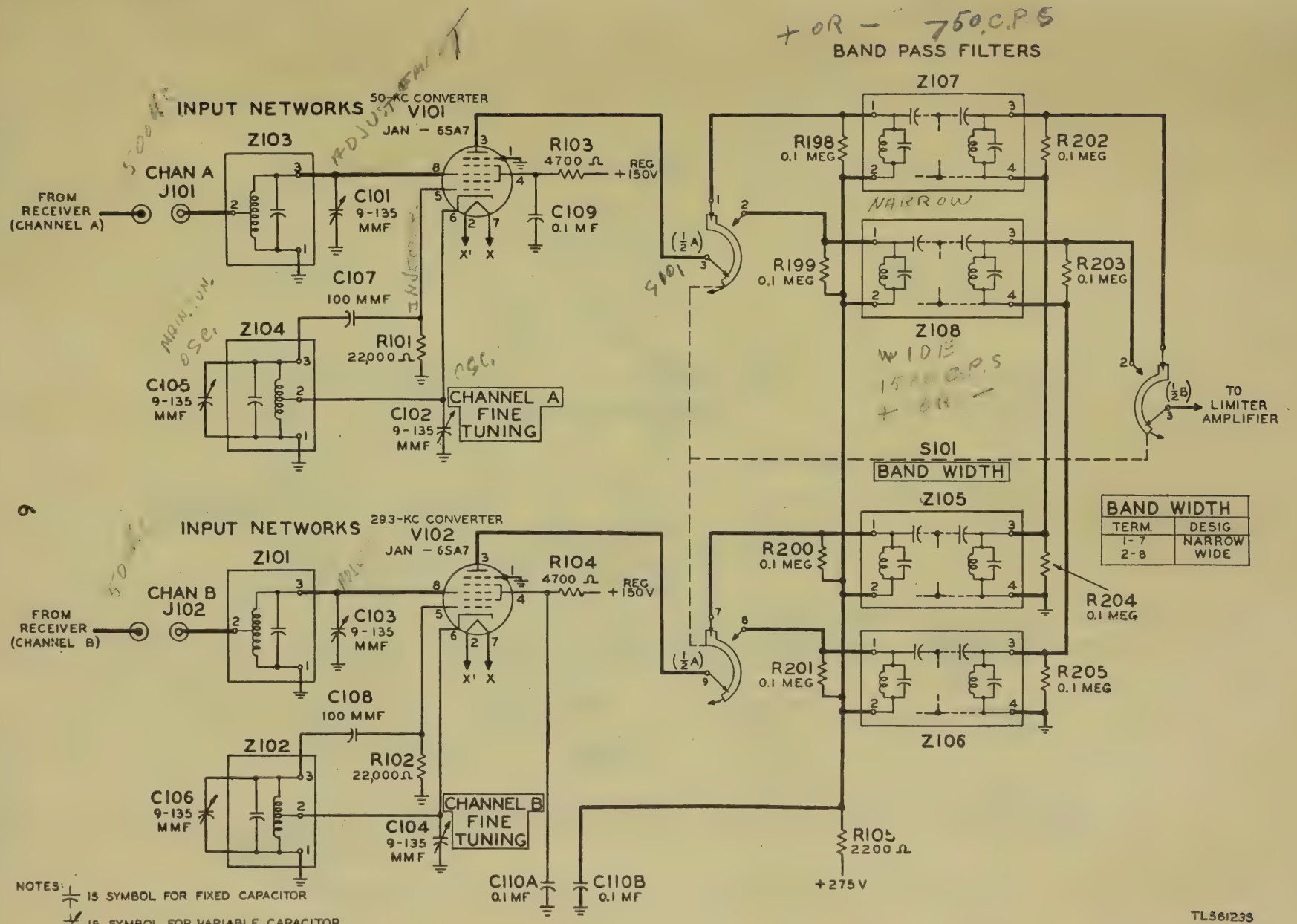


Figure 23. Dual diversity converter input circuit, simplified schematic diagram.

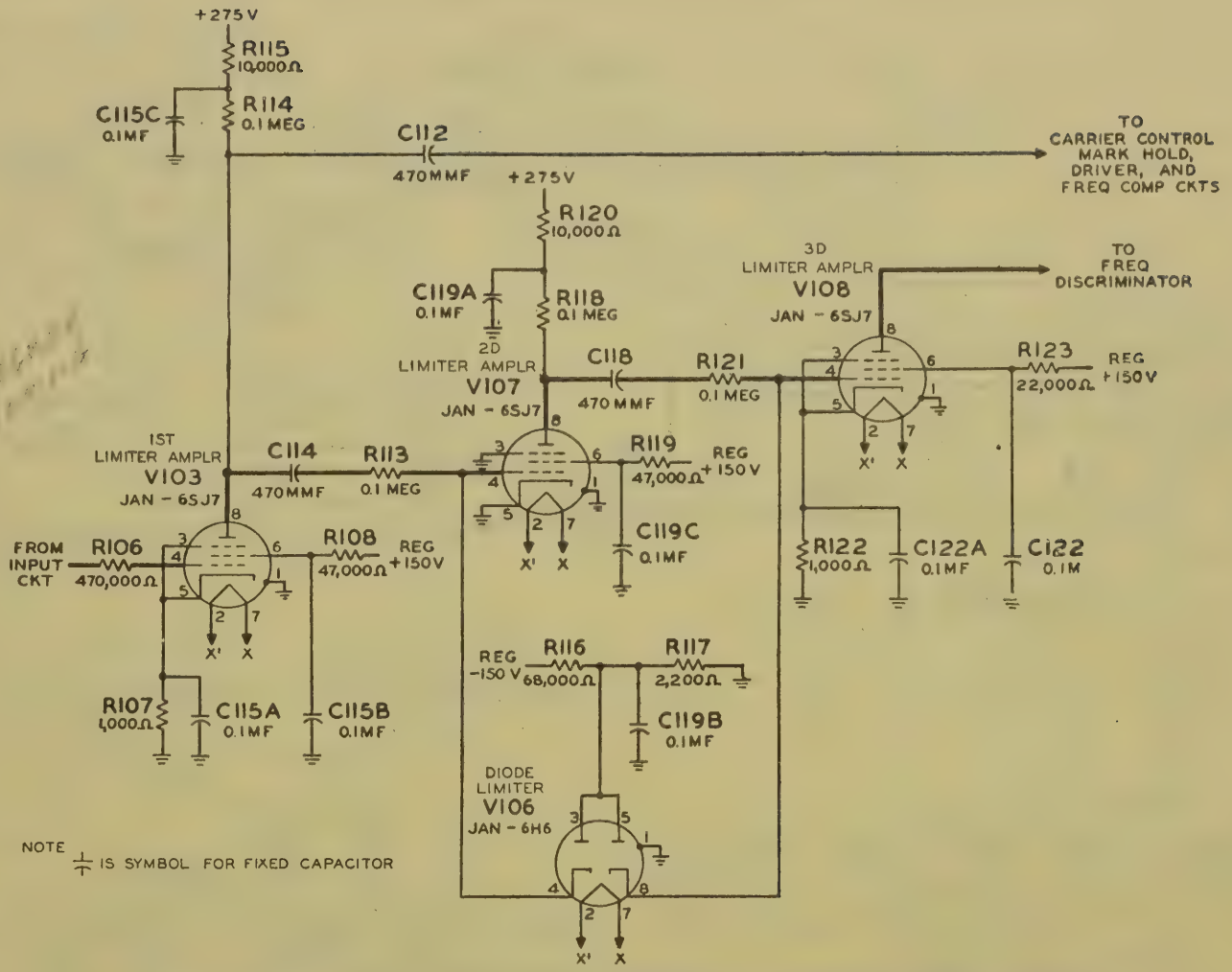
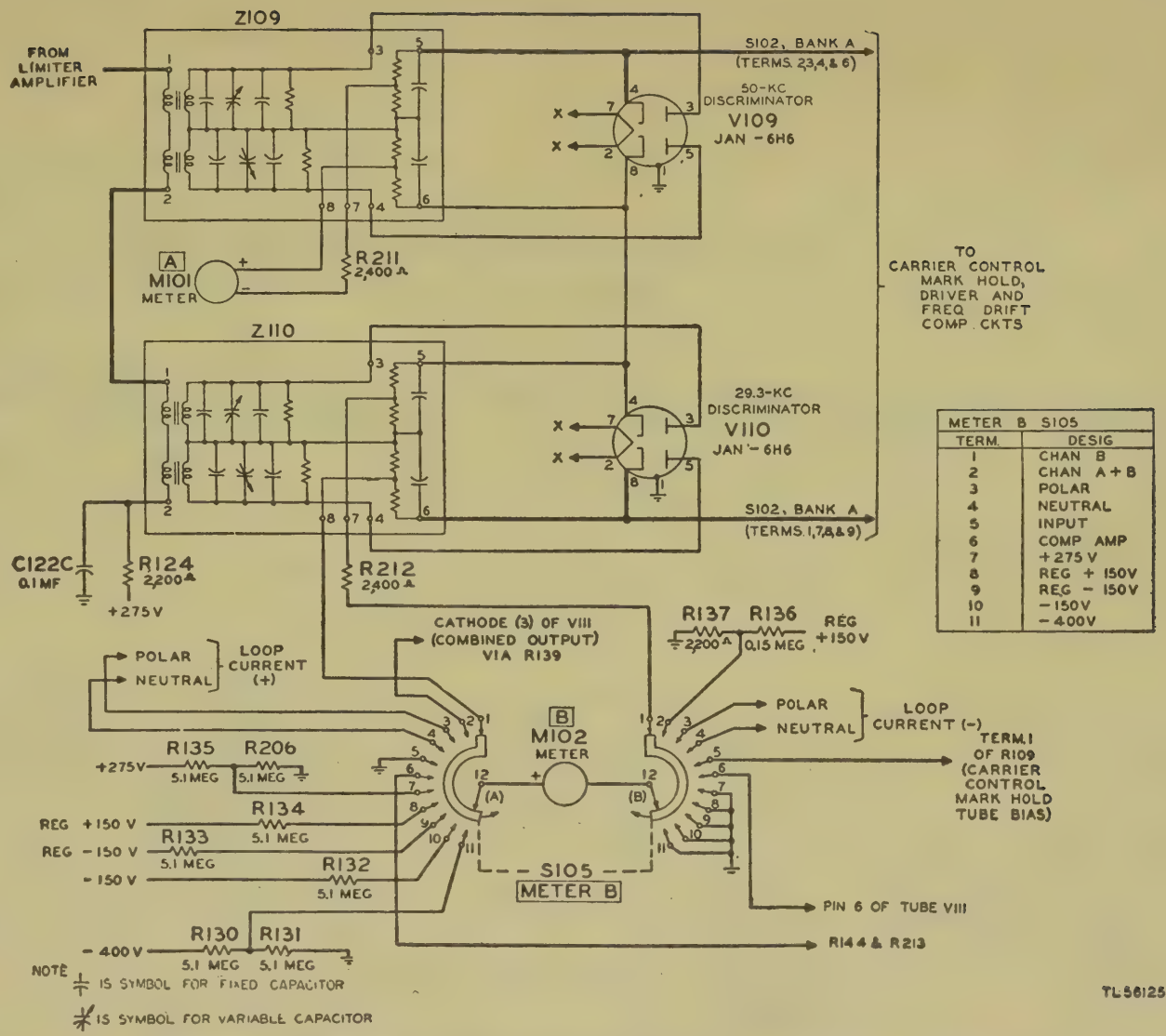
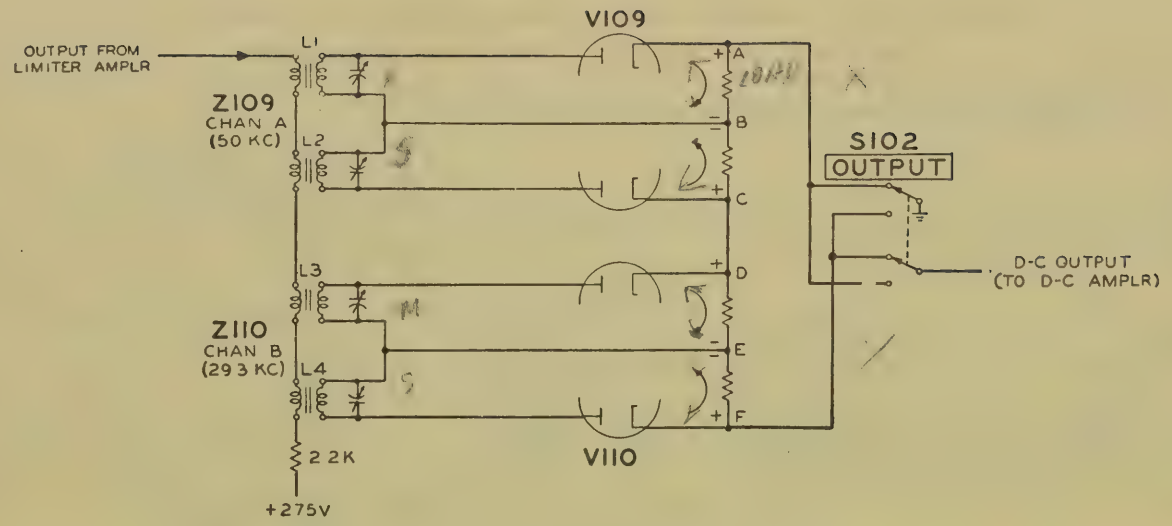


Figure 24. Dual diversity converter limiter amplifier circuit, simplified schematic diagram

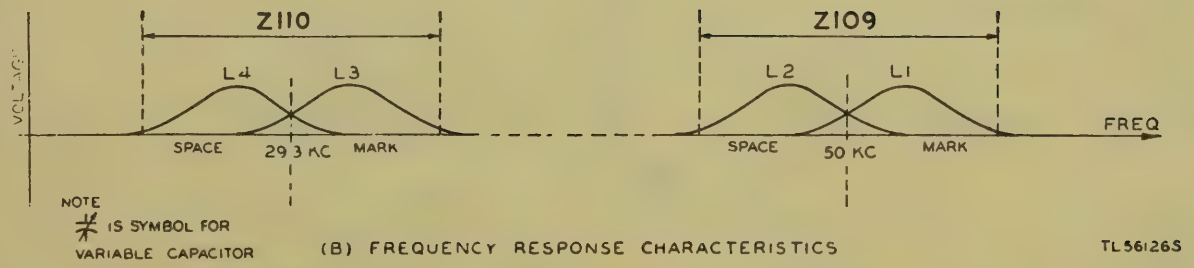


METER B S105	
TERM.	DESIG
1	CHAN B
2	CHAN A + B
3	POLAR
4	NEUTRAL
5	INPUT
6	COMP AMP
7	+275 V
8	REG + 150V
9	REG - 150V
10	-150V
11	-400V

Figure 25. Dual diversity converter linear discriminator, simplified schematic diagram.



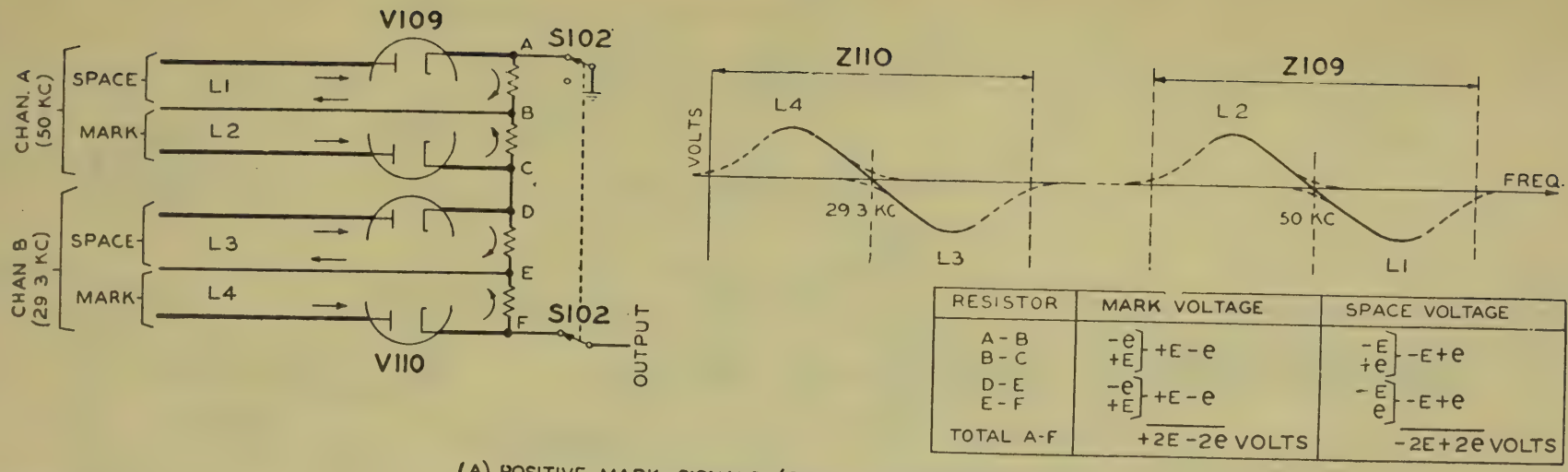
(A) SIMPLIFIED DISCRIMINATOR SCHEMATIC



(B) FREQUENCY RESPONSE CHARACTERISTICS

TL56126S

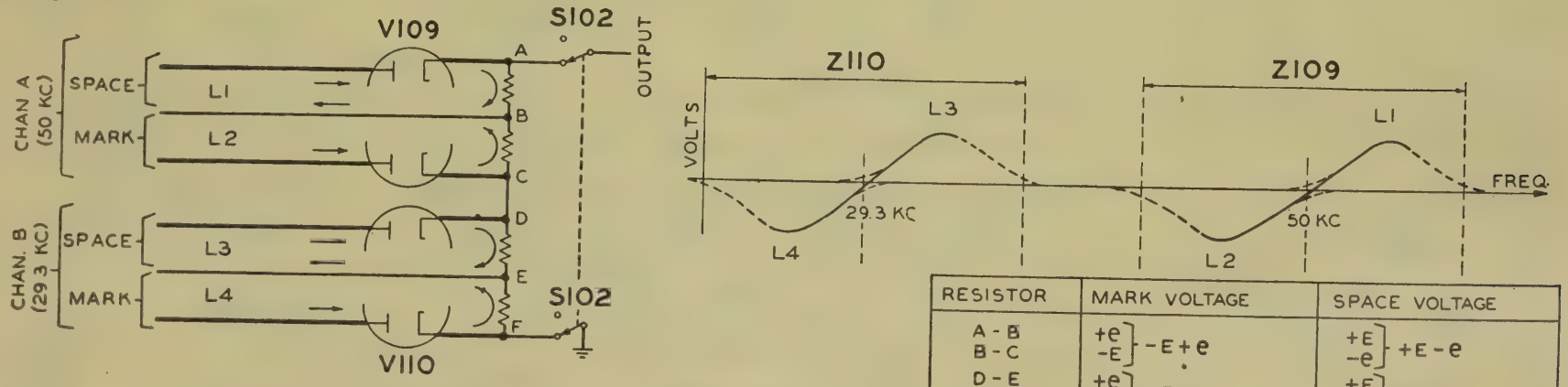
Figure 26. Dual diversity converter linear discriminator operation.



RESISTOR	MARK VOLTAGE	SPACE VOLTAGE
A-B, B-C	$\begin{matrix}-e\\+E\end{matrix}$ $+E-e$	$\begin{matrix}-E\\+e\end{matrix}$ $-E+e$
D-E, E-F	$\begin{matrix}-e\\+E\end{matrix}$ $+E-e$	$\begin{matrix}-E\\e\end{matrix}$ $-E+e$
TOTAL A-F	$+2E-2e$ VOLTS	$-2E+2e$ VOLTS

(A) POSITIVE MARK SIGNALS (SWITCH S102 IN POSITION 1)

10



RESISTOR	MARK VOLTAGE	SPACE VOLTAGE
A-B, B-C	$\begin{matrix}+e\\-E\end{matrix}$ $-E+e$	$\begin{matrix}+E\\-e\end{matrix}$ $+E-e$
D-E, E-F	$\begin{matrix}+e\\-E\end{matrix}$ $-E+e$	$\begin{matrix}+E\\-e\end{matrix}$ $+E-e$
TOTAL A-F	$-2E+2e$ VOLTS	$+2E-2e$ VOLTS

(B) NEGATIVE MARK SIGNALS (SWITCH S102 IN POSITION 2)

TL 56127S

Figure 27. Dual diversity converter linear discriminator, theory diagrams.

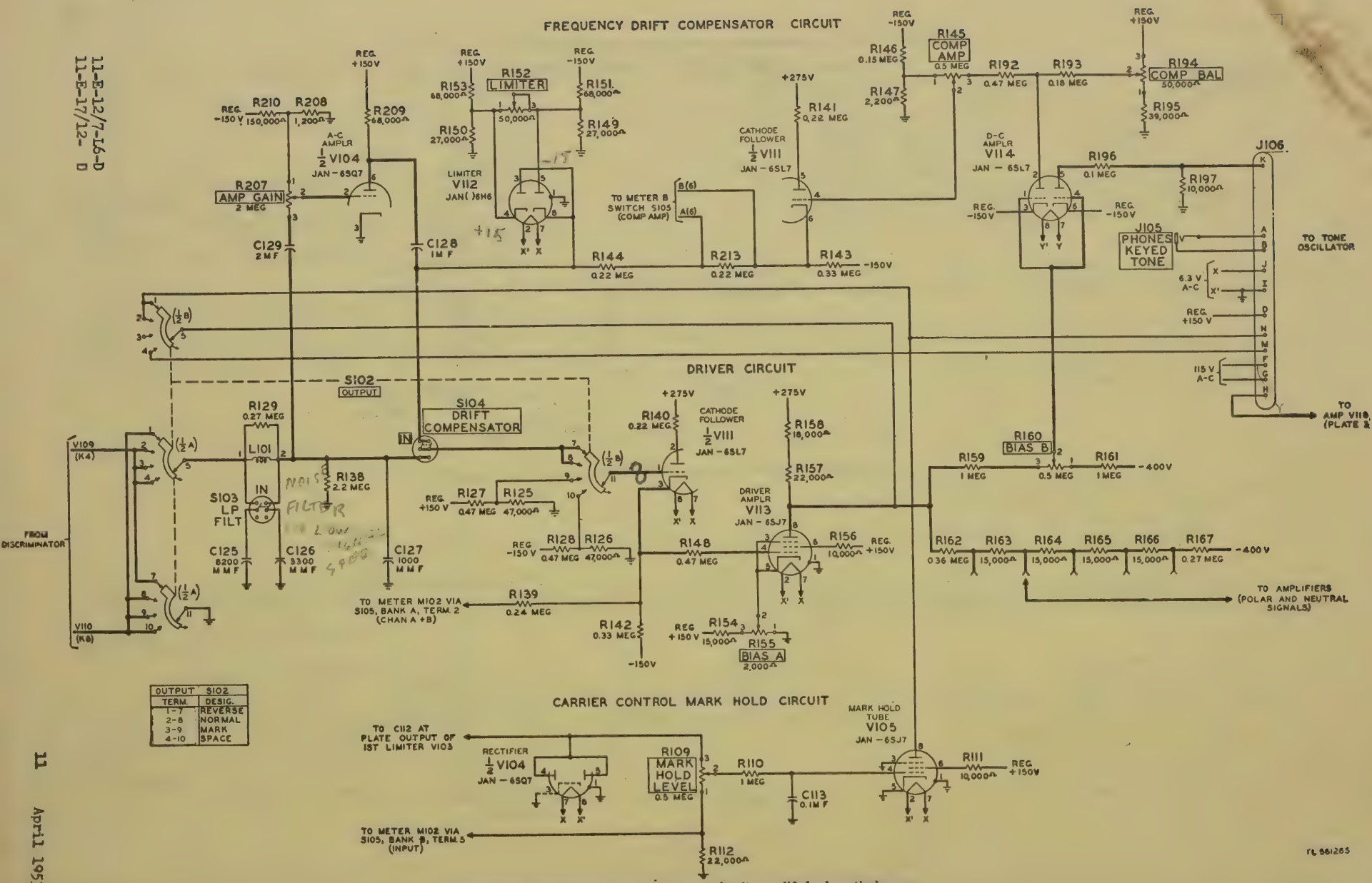


Figure 28. Dual diversity converter output circuit, simplified schematic diagram.

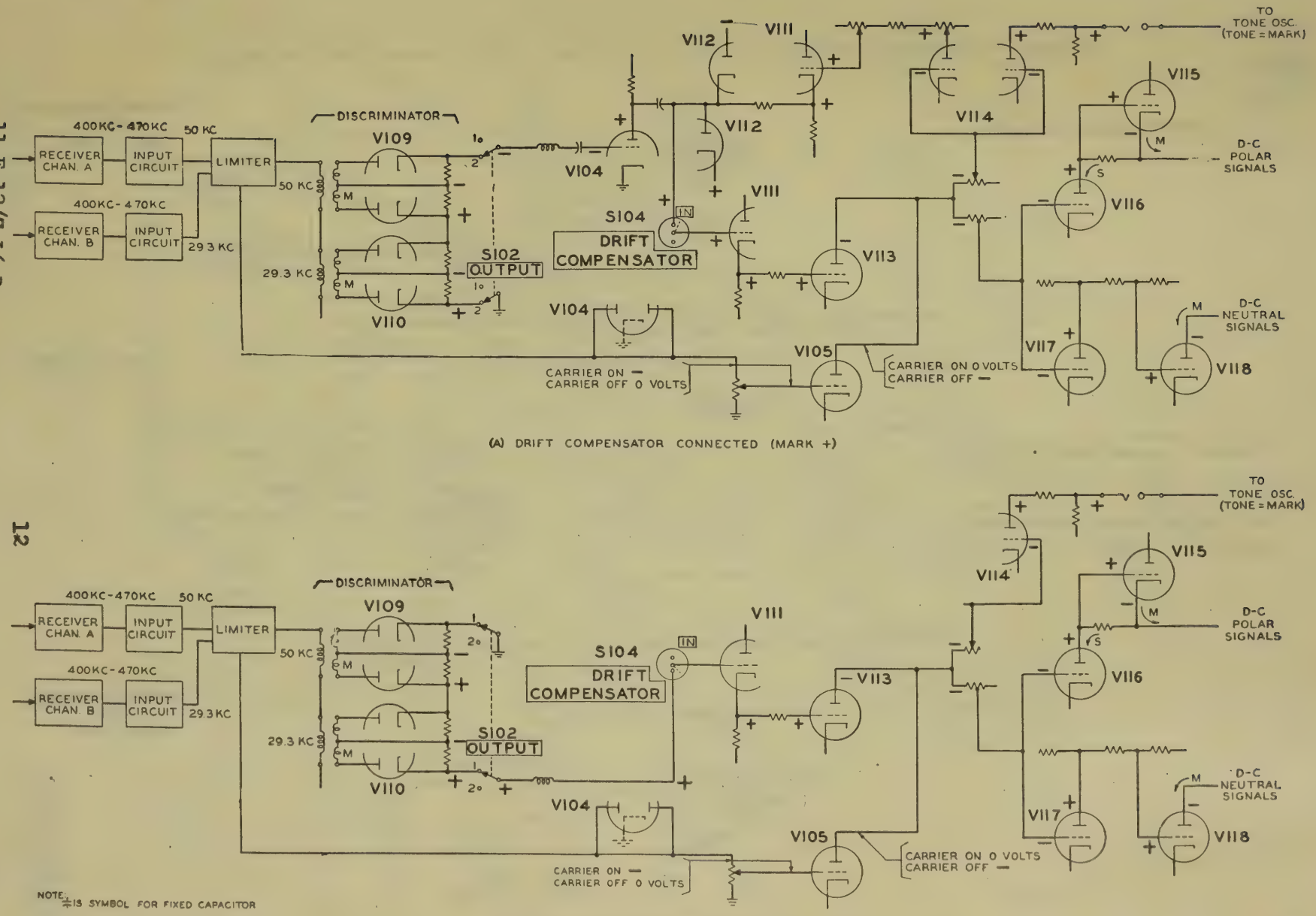


Figure 29. Dual diversity converter polarity relations, theory diagram.

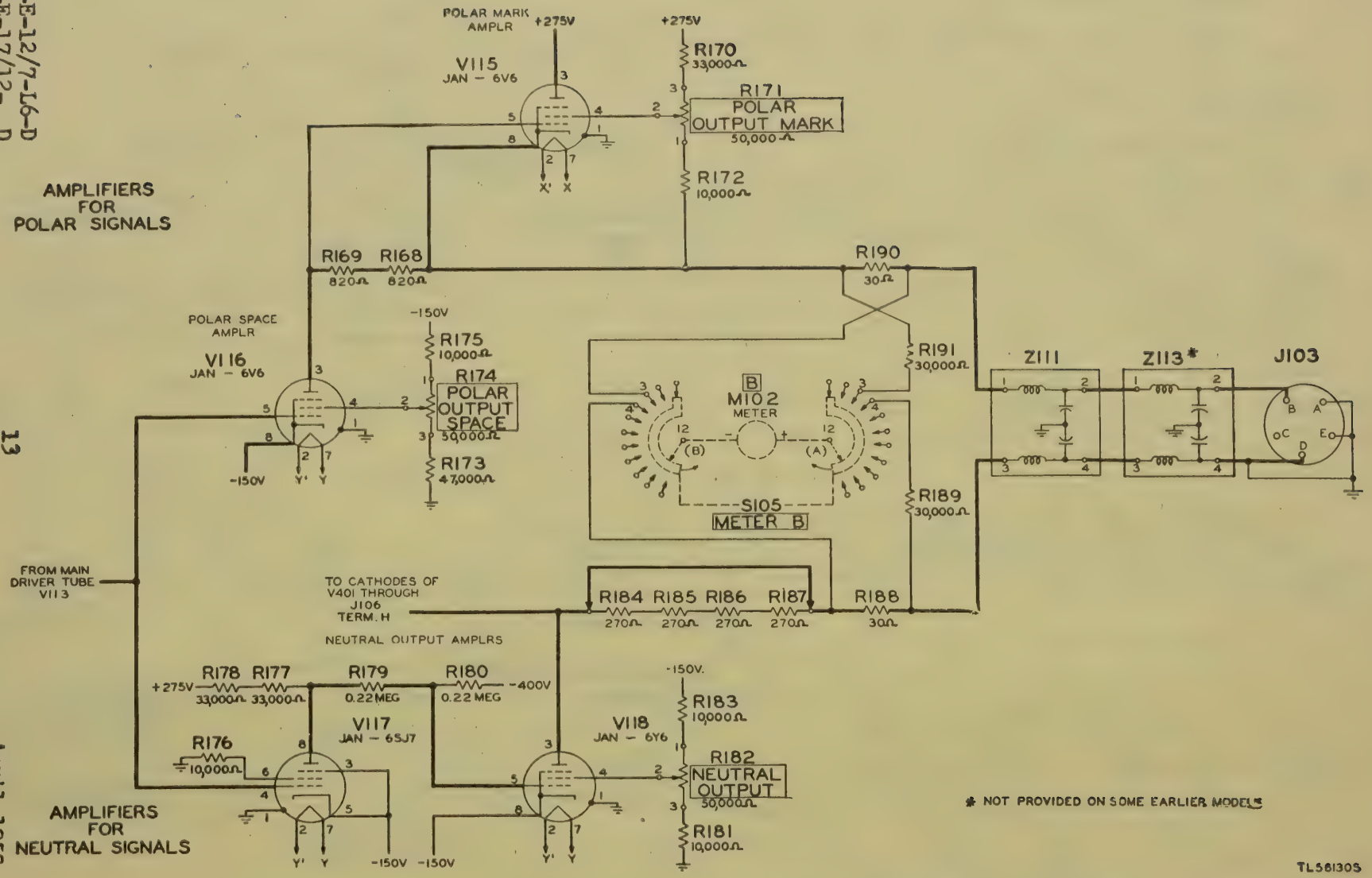


Figure 30. Dual diversity converter amplifiers for polar and neutral signals, simplified schematic diagram.

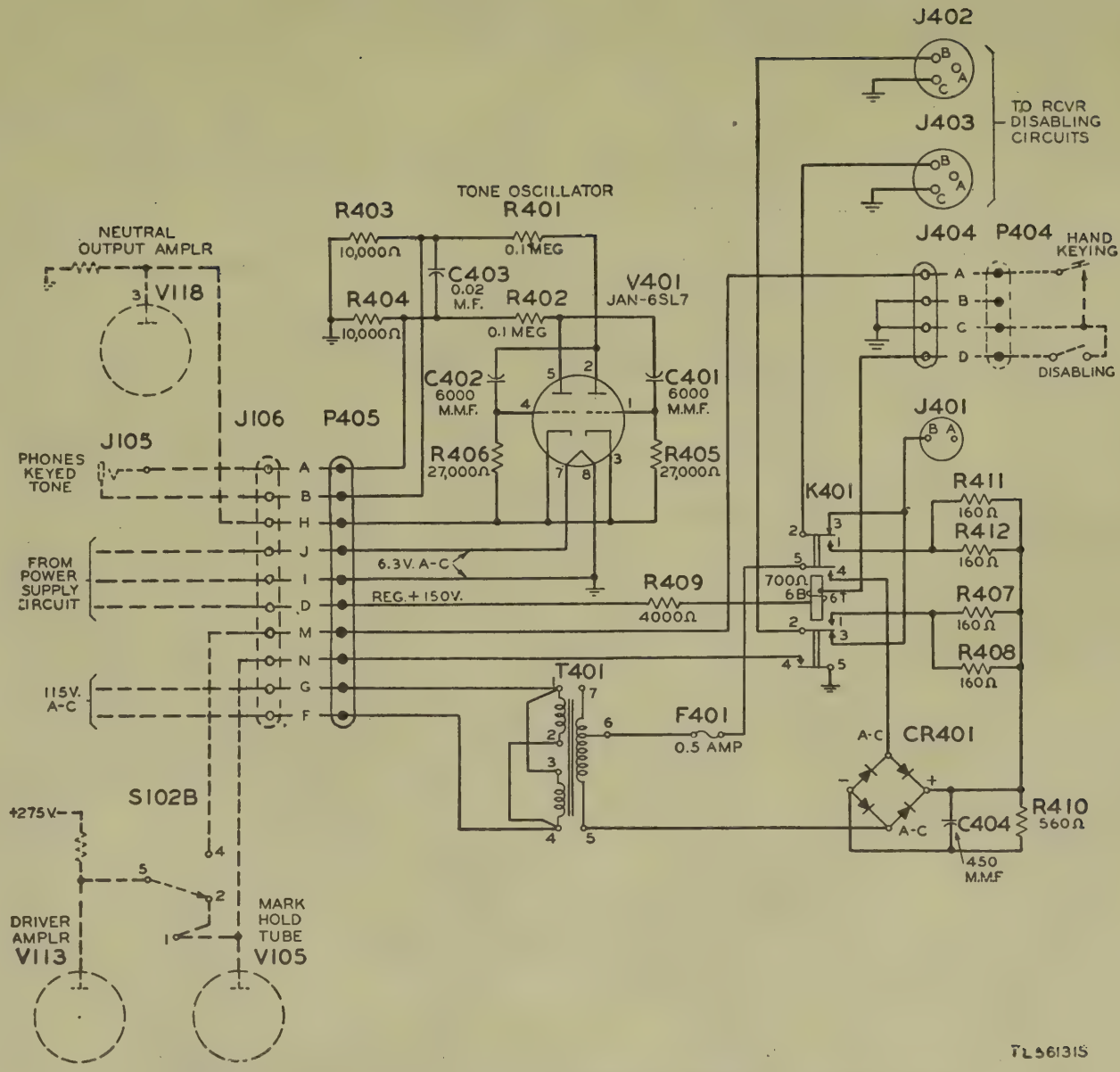


Figure 31. Dual diversity converter tone oscillator, simplified schematic diagram.

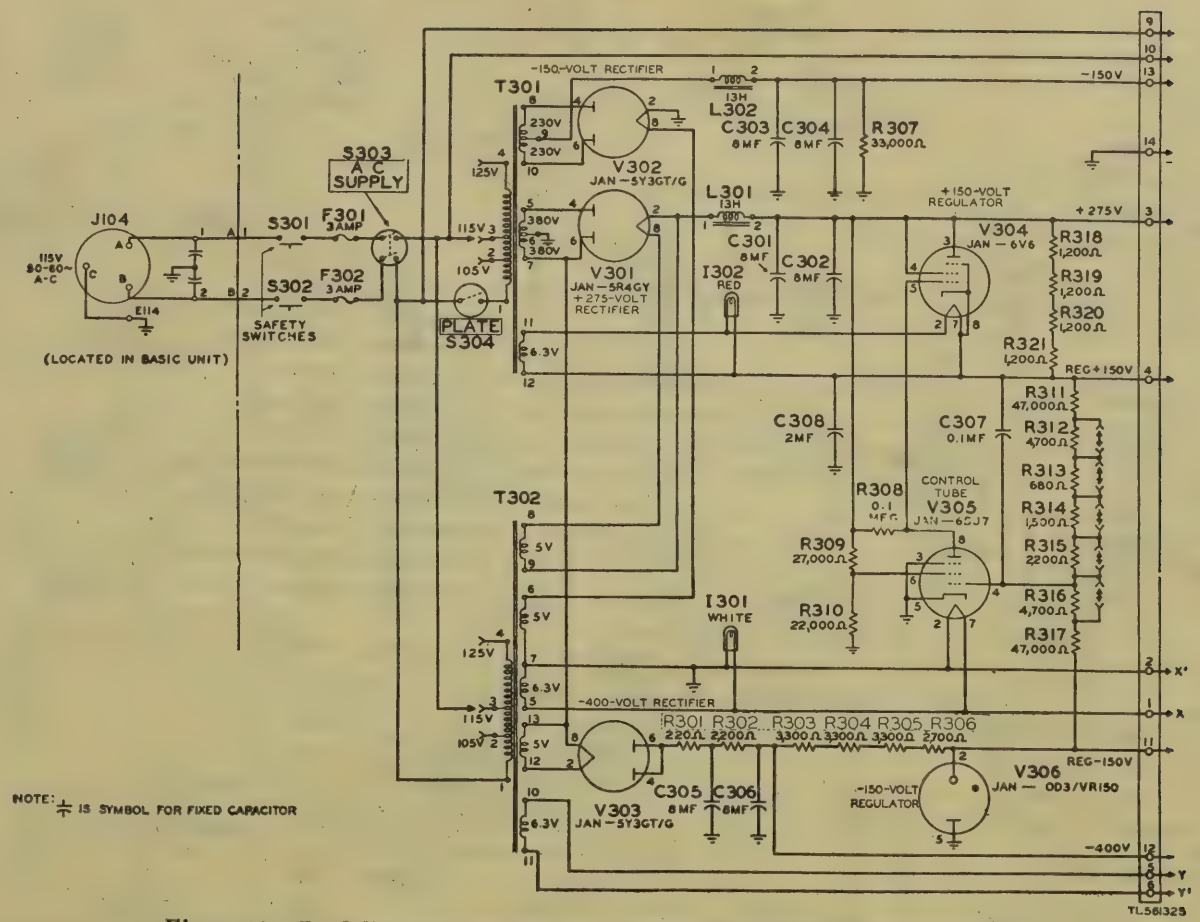


Figure 32. Dual diversity converter power supply, simplified schematic diagram.

SCHEMATIC
AND
BLOCK DIAGRAMS
OF
RADIO SET AN/GRC-26 A

THE SOUTHEASTERN SIGNAL SCHOOL
Camp Gordon, Georgia

1

11-E-12/13-D

JULY 1954

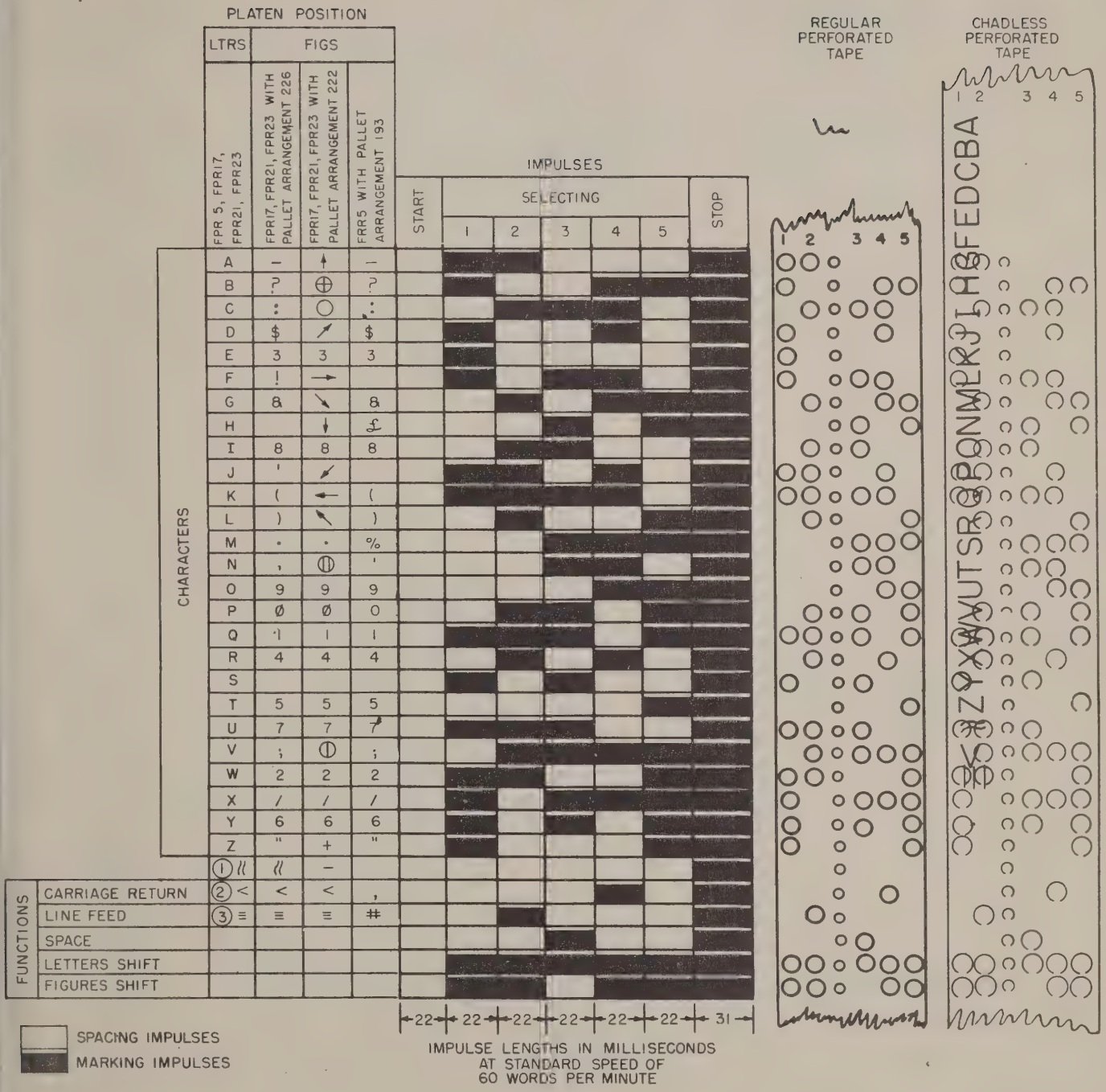
Army Ft McPherson Ga 956/54

THE SOUTHEASTERN SIGNAL SCHOOL
Camp Gordon, Georgia

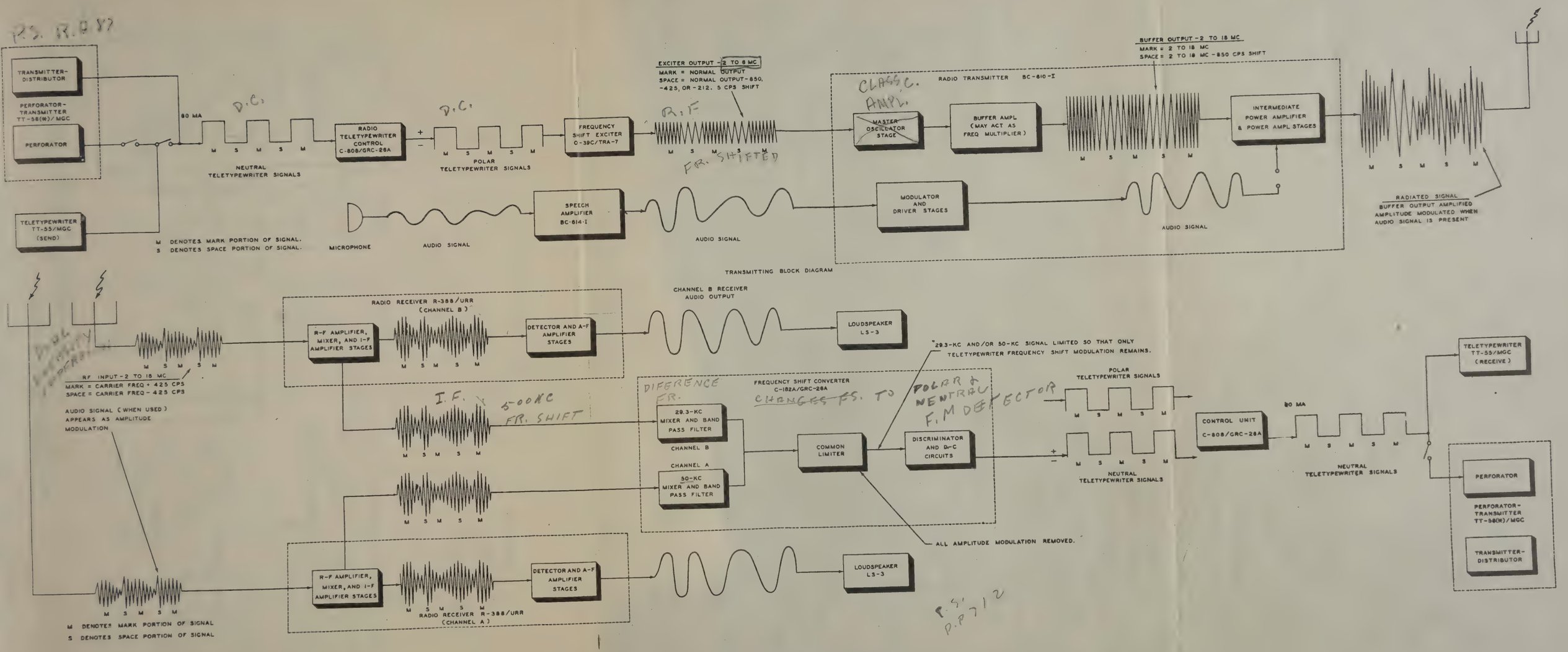
SCHEMATIC AND BLOCK DIAGRAMS

RADIO SET AN/GRC-26A

NUMBER	TITLE
1	Five-Unit Start-Stop Teletypewriter Code
2	Radio Set AN/GRC-26A, Functional Block Diagram
3	Radioteletypewriter Control C-808/GRC-26A, Simplified Circuit
4	Radioteletypewriter Control C-808/GRC-26A, Schematic Diagram
5	Frequency Shift Exciter O-39/TRA-7, Schematic Diagram
6	Rectifier RA-87, Schematic Diagram
7	Radio Receiver R-388/URR, Block Diagram
8	Radio Receiver R-388/URR, Schematic Diagram
9	Frequency Shift Converter CV-182A/GRC-26A, Block Diagram
10	Frequency Shift Converter CV-182A/GRC-26A, Schematic Diagram
11	Frequency Shift Converter Tone Oscillator, Simplified Schematic Diagram
12	Power Supply PP-712A/GRC-26A less Tone Oscillator, Schematic Diagram

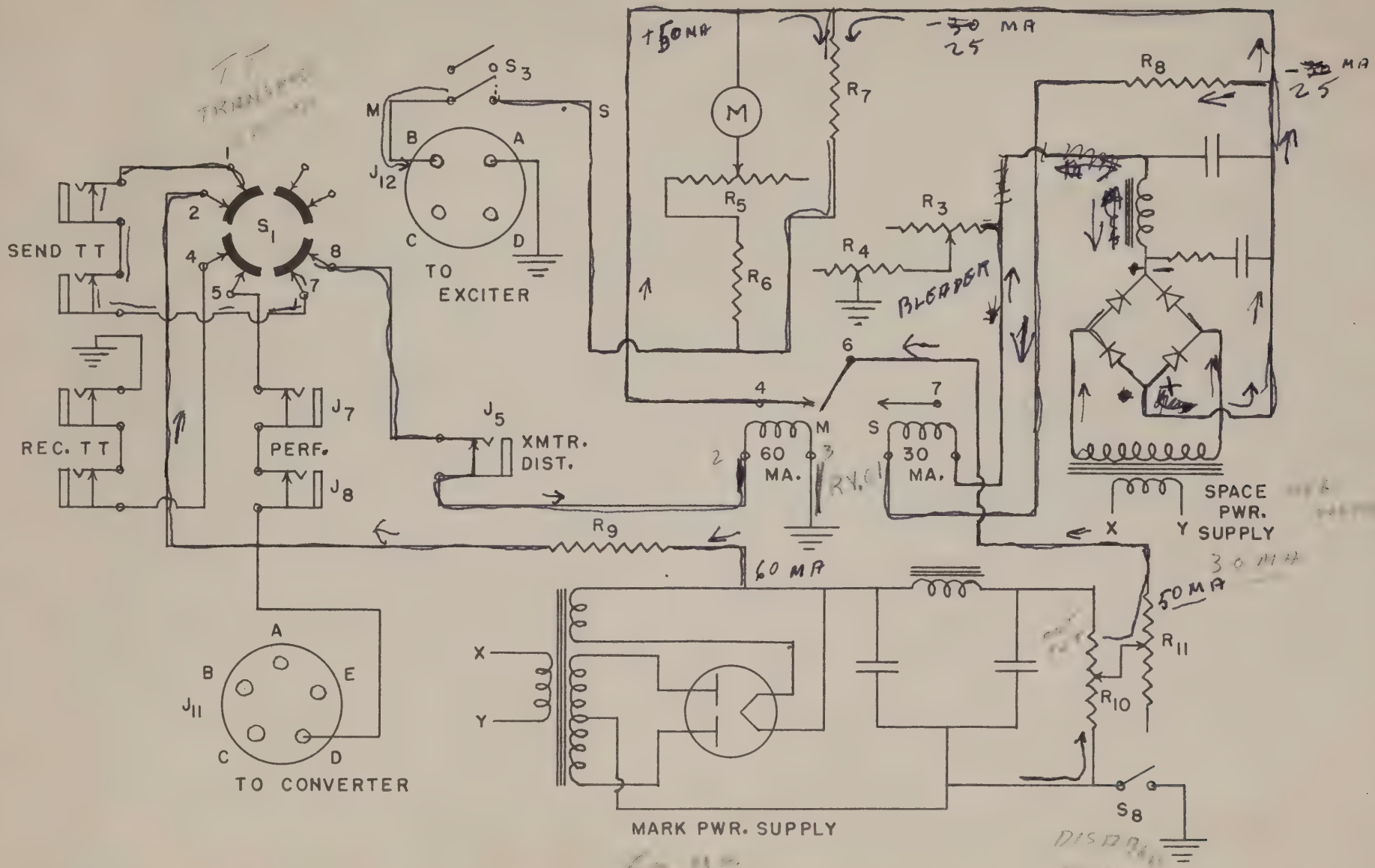


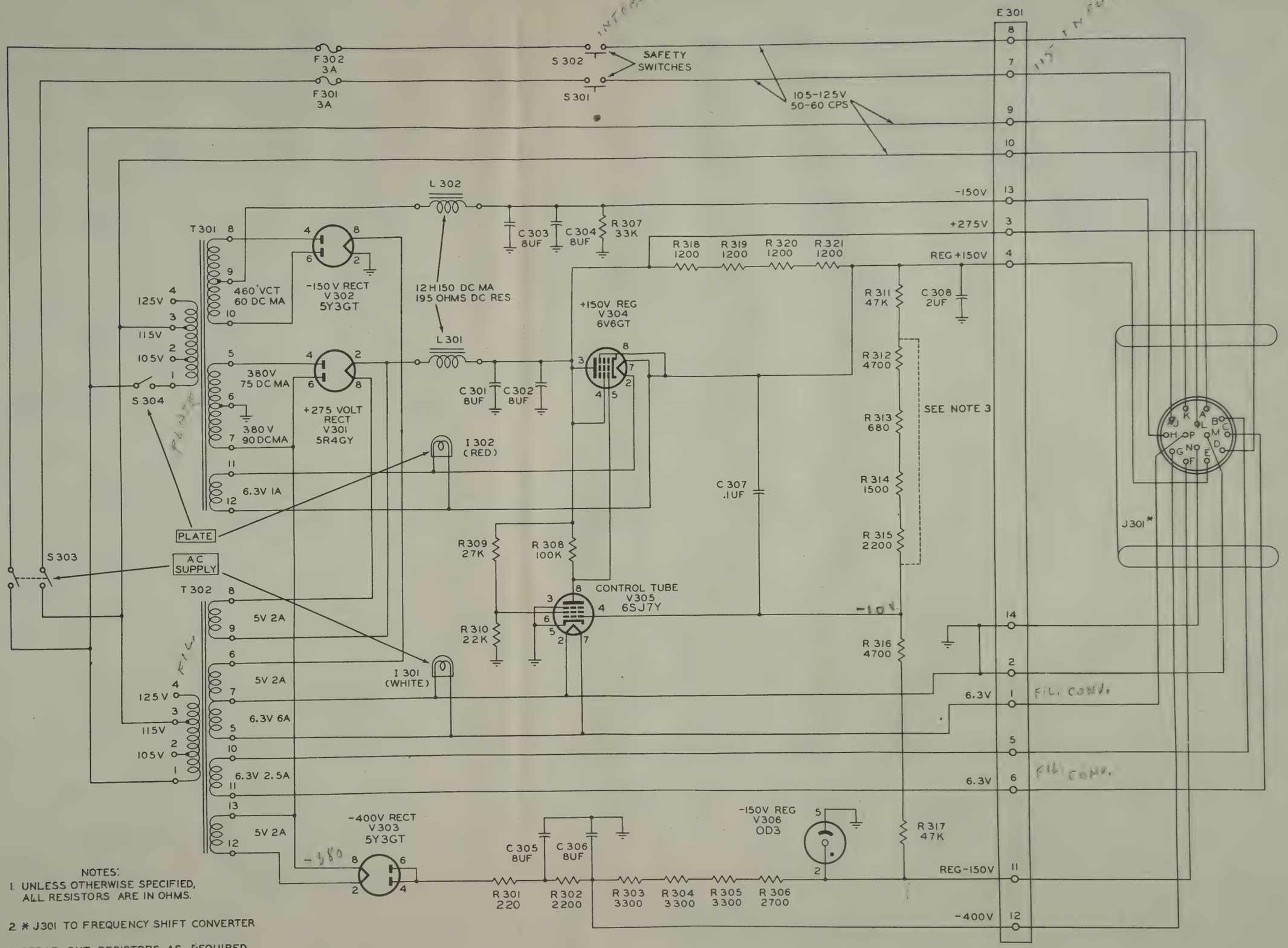
1. ***Five-unit start-stop teletypewriter code.***


TRANSMITTER-DISTRIBUTOR
PERFORATOR-TRANSMITTER TT-58(*)/MGC
PERFORATOR
TELETYPEWRITER TT-55/MGC (SEND)
80 MA
D.C.
NEUTRAL TELETYPEWRITER SIGNALS
RADIO TELETYPEWRITER CONTROL C-808/GRC-28A
POLAR TELETYPEWRITER SIGNALS
FREQUENCY SHIFT EXCITER O-39C/TRA-7
EXCITER OUTPUT - 2 TO 8 MC
MARK = NORMAL OUTPUT
SPACE = NORMAL OUTPUT - 850, -425, OR -212.5 CPS SHIFT
R.F.
FR. SHIFTED
M DENOTES MARK PORTION OF SIGNAL.
S DENOTES SPACE PORTION OF SIGNAL.
MICROPHONE
AUDIO SIGNAL
SPEECH AMPLIFIER BC-614-I
AUDIO SIGNAL
RADIO TRANSMITTER BC-610-I
CLASS C. AMPL.
MASTER OSCILLATOR STAGE
BUFFER AMPL (MAY ACT AS FREQ MULTIPLIER)
BUFFER OUTPUT - 2 TO 18 MC
MARK = 2 TO 18 MC
SPACE = 2 TO 18 MC - 850 CPS SHIFT
INTERMEDIATE POWER AMPLIFIER & POWER AMPL STAGES
MODULATOR AND DRIVER STAGES
AUDIO SIGNAL
RADIATED SIGNAL
BUFFER OUTPUT AMPLIFIED AMPLITUDE MODULATED WHEN AUDIO SIGNAL IS PRESENT
TRANSMITTING BLOCK DIAGRAM
RF INPUT - 2 TO 18 MC
MARK = CARRIER FREQ + 425 CPS
SPACE = CARRIER FREQ - 425 CPS
AUDIO SIGNAL (WHEN USED) APPEARS AS AMPLITUDE MODULATION
RADIO RECEIVER R-388/URR (CHANNEL B)
R-F AMPLIFIER, MIXER, AND I-F AMPLIFIER STAGES
DETECTOR AND A-F AMPLIFIER STAGES
CHANNEL B RECEIVER AUDIO OUTPUT
LOUDSPEAKER LS-3
I.F.
500 KC FR. SHIFT
DIFFERENCE FR.
FREQUENCY SHIFT CONVERTER C-182A/GRC-28A
CHANGES FS. TO POLAR & NEUTRAL F.M DETECTOR
29.3-KC MIXER AND BAND PASS FILTER
CHANNEL B
CHANNEL A
50-KC MIXER AND BAND PASS FILTER
COMMON LIMITER
DISCRIMINATOR AND D-C CIRCUITS
*29.3-KC AND/OR 50-KC SIGNAL LIMITED SO THAT ONLY TELETYPEWRITER FREQUENCY SHIFT MODULATION REMAINS.
ALL AMPLITUDE MODULATION REMOVED.
POLAR TELETYPEWRITER SIGNALS
NEUTRAL TELETYPEWRITER SIGNALS
CONTROL UNIT C-808/GRC-28A
80 MA
NEUTRAL TELETYPEWRITER SIGNALS
TELETYPEWRITER TT-55/MGC (RECEIVE)
PERFORATOR
PERFORATOR-TRANSMITTER TT-58(*)/MGC
TRANSMITTER-DISTRIBUTOR
M DENOTES MARK PORTION OF SIGNAL
S DENOTES SPACE PORTION OF SIGNAL
RADIO RECEIVER R-388/URR (CHANNEL A)
R-F AMPLIFIER, MIXER, AND I-F AMPLIFIER STAGES
DETECTOR AND A-F AMPLIFIER STAGES
LOUDSPEAKER LS-3

2. *Radio Set AN/GRC-26A, functional block diagram.*

3. RADIO TELETYPEWRITER CONTROL C-808/GRC 26-A

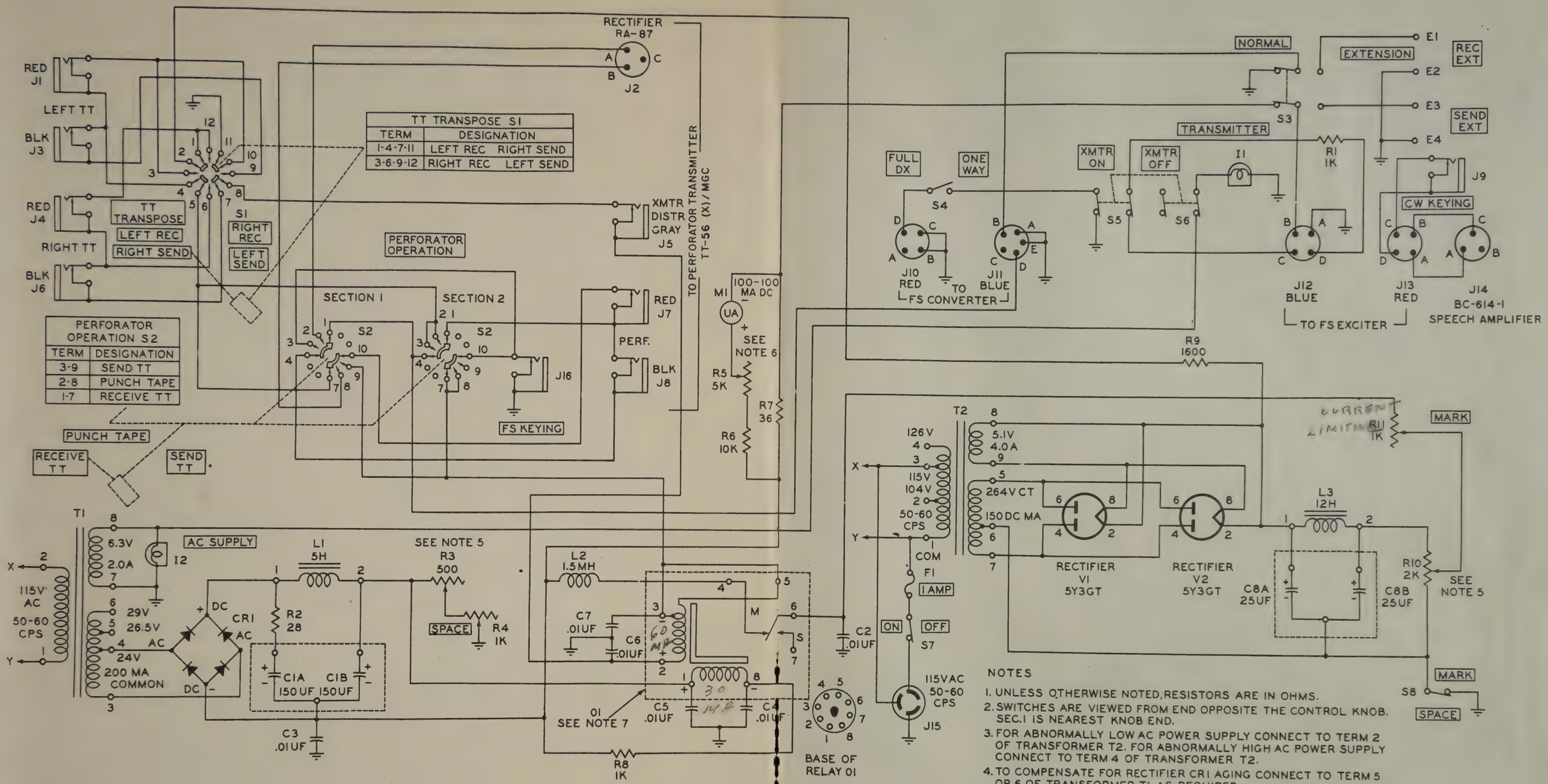




NOTES:

1. UNLESS OTHERWISE SPECIFIED, ALL RESISTORS ARE IN OHMS.
2. * J301 TO FREQUENCY SHIFT CONVERTER
3. STRAP OUT RESISTORS AS REQUIRED TO OBTAIN PROPER VOLTAGE DIFFERENCE BETWEEN REG+ 150 V AND REG-150 V.

12. *Power Supply PP-712A/GRC-26A less tone oscillator, schematic diagram.*



NOTES

1. UNLESS OTHERWISE NOTED, RESISTORS ARE IN OHMS.
2. SWITCHES ARE VIEWED FROM END OPPOSITE THE CONTROL KNOB. SEC. 1 IS NEAREST KNOB END.
3. FOR ABNORMALLY LOW AC POWER SUPPLY CONNECT TO TERM 2 OF TRANSFORMER T2. FOR ABNORMALLY HIGH AC POWER SUPPLY CONNECT TO TERM 4 OF TRANSFORMER T2.
4. TO COMPENSATE FOR RECTIFIER CR1 AGING CONNECT TO TERM 5 OR 6 OF TRANSFORMER T1, AS REQUIRED.
5. ADJUST R10 AND R3 TO SET FRONT PANEL CONTROLS, MARK AND SPACE, RESPECTIVELY IN CENTER OF THEIR RANGE UNDER NORMAL OPERATING CONDITIONS.
6. R5 IS METER CALIBRATION CONTROL. METER READS 3/1000 OF ACTUAL CIRCUIT CURRENT.
7. RELAY 01 SPACE CONDITION WINDING 1 AND 8 ENERGIZED (30 MA) CONTACTS 6 AND 7 CLOSED. MARKED CONDITION WINDING 2 AND 3 ENERGIZED (60 MA) CONTACTS 4 AND 6 CLOSED.

4. Radioteletypewriter Control C-808/GRC-26A, schematic diagram.

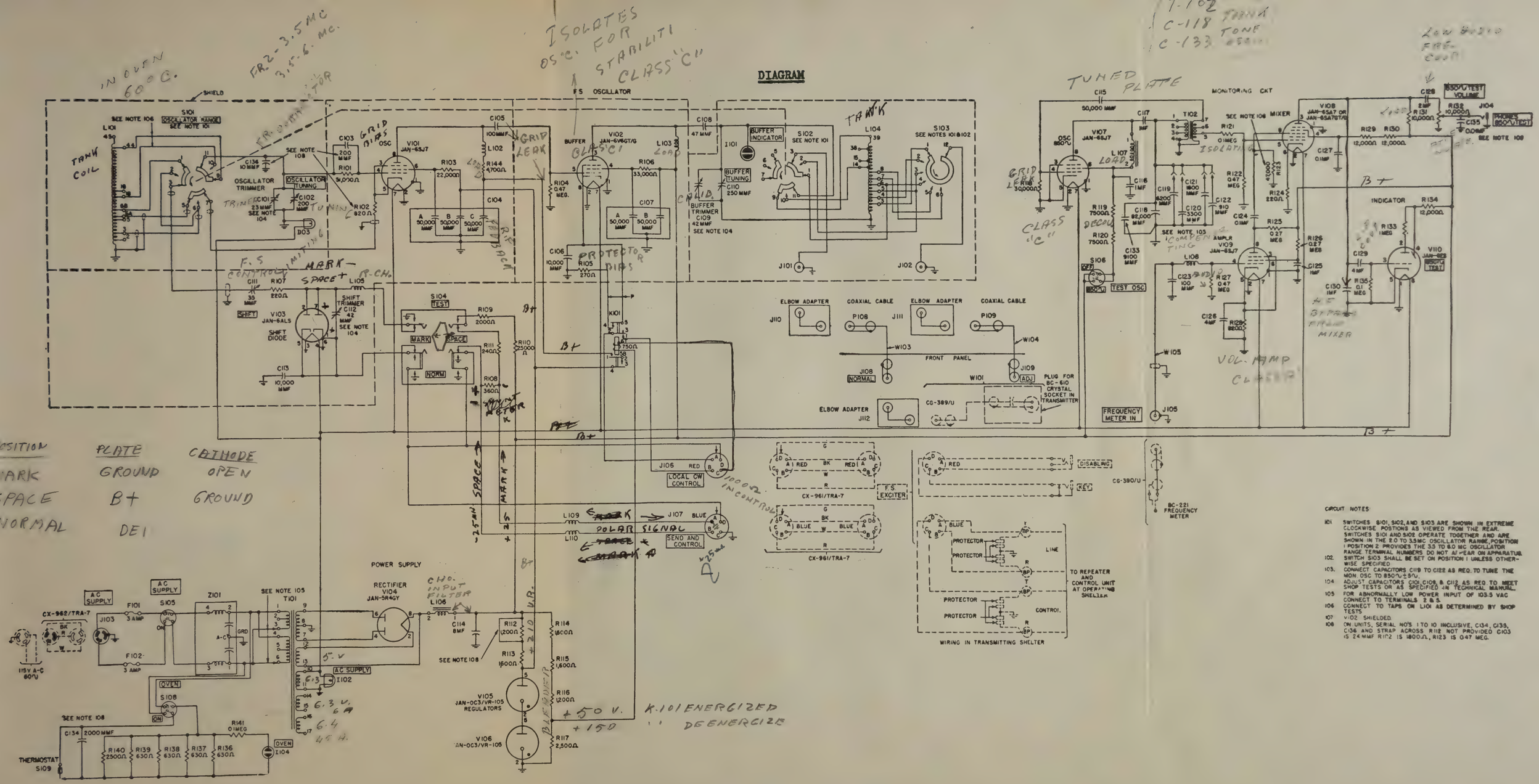
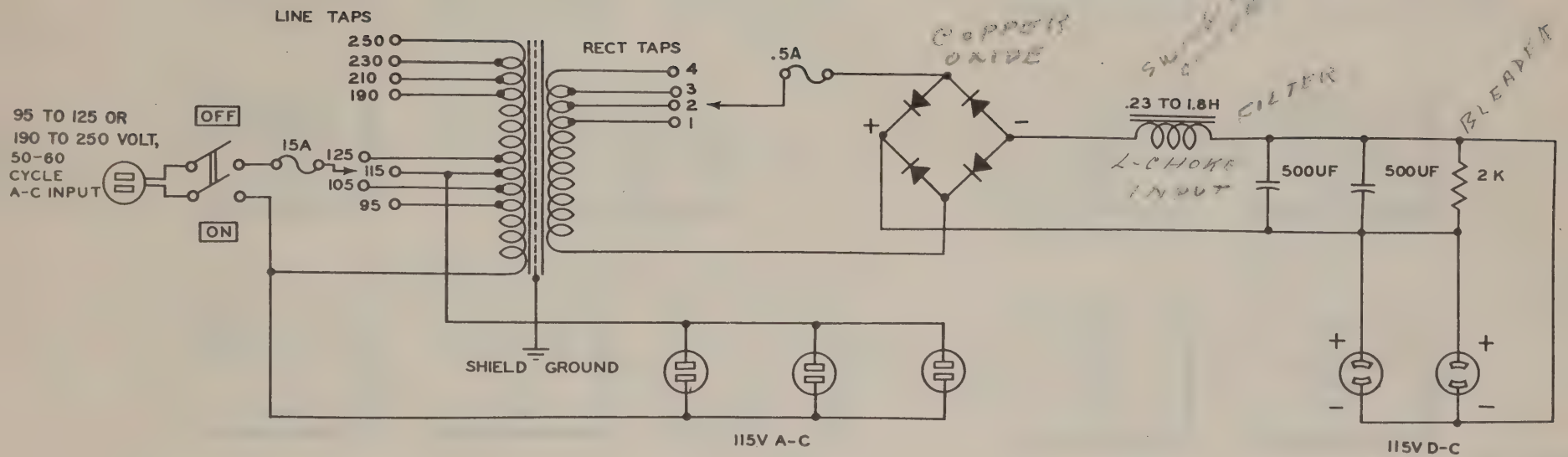
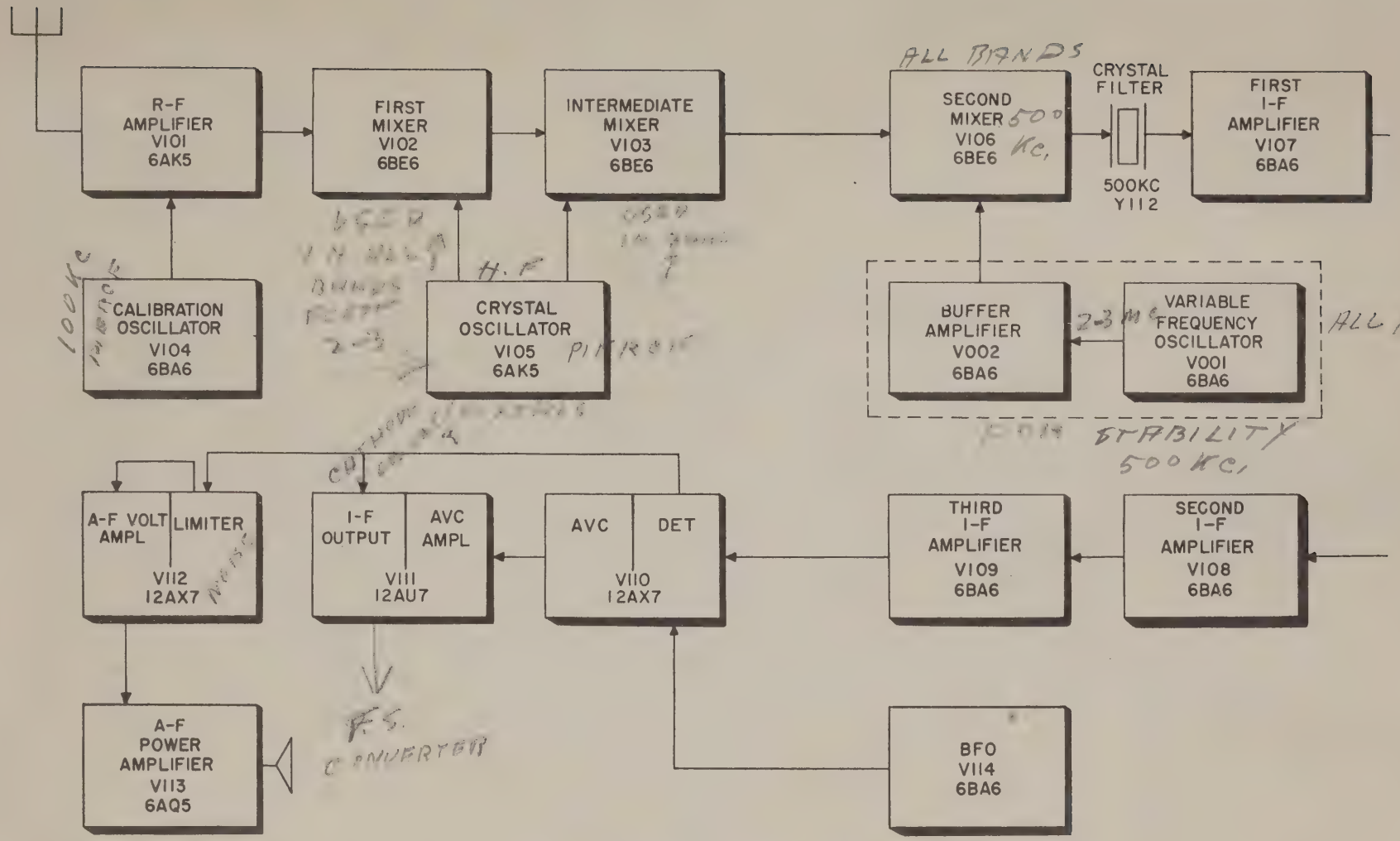


DIAGRAM
F-S OSCILLATOR
MONITORING CKT
MIXER
AMPLR
INDICATOR
TUNED PLATE
TANK
BUFFER
GRID LEAK
GRID BIAS
PROTECTOR DIAS
F.S CONTROL
MARK
SPACE
B+
ELBOW ADAPTER
COAXIAL CABLE
FRONT PANEL
NORMAL
ADJ
PLUG FOR BC-610 CRYSTAL SOCKET IN TRANSMITTER
FREQUENCY METER IN
TEST OSC
VOL. AMP CLASS
LOCAL CW CONTROL
SEND AND CONTROL
F-S EXCITER
CX-961/TRA-7
DISABLING
KEY
CG-390/U
BC-221 FREQUENCY METER
TO REPEATER AND CONTROL UNIT AT OPERATING SHELTER
WIRING IN TRANSMITTING SHELTER
POWER SUPPLY
RECTIFIER V104 JAN-5R4GY
CHO. INPUT FILTER
A.C SUPPLY
OVEN
THERMOSTAT S109
V105 JAN-0C3/VR-105 REGULATORS
V106 JAN-0C3/VR-105
+150 V.
+50 V.
6.3 V. 6A
6.4 V. 4A
K.101 ENERGIZED
DEENERGIZE
POSITION
PLATE
CATHODE
MARK
GROUND
OPEN
SPACE
B+
GROUND
NORMAL
DEI
CIRCUIT NOTES:
101 SWITCHES S101, S102, AND S103 ARE SHOWN IN EXTREME CLOCKWISE POSITIONS AS VIEWED FROM THE REAR. SWITCHES S101 AND S102 OPERATE TOGETHER AND ARE SHOWN IN THE 2.0 TO 3.5 MC OSCILLATOR RANGE, POSITION 1 POSITION 2 PROVIDES THE 3.5 TO 6.0 MC OSCILLATOR RANGE. TERMINAL NUMBERS DO NOT APPEAR ON APPARATUS.
102. SWITCH S103 SHALL BE SET ON POSITION 1 UNLESS OTHERWISE SPECIFIED.
103. CONNECT CAPACITORS C119 TO C122 AS REQ. TO TUNE THE MON. OSC TO 850 V. 2 P.U.
104 ADJUST CAPACITORS C101, C108, & C112 AS REQ. TO MEET SHOP TESTS OR AS SPECIFIED IN TECHNICAL MANUAL.
105 FOR ABNORMALLY LOW POWER INPUT OF 103.5 VAC CONNECT TO TERMINALS 2 & 3.
106 CONNECT TO TAPS ON L101 AS DETERMINED BY SHOP TESTS.
107 V102 SHIELDED.
108 ON UNITS, SERIAL NO'S 1 TO 10 INCLUSIVE, C134, C135, C136 AND STRAP ACROSS R112 NOT PROVIDED. C103 IS 24 MMF, R172 IS 1800Ω, R123 IS 0.47 MEG.

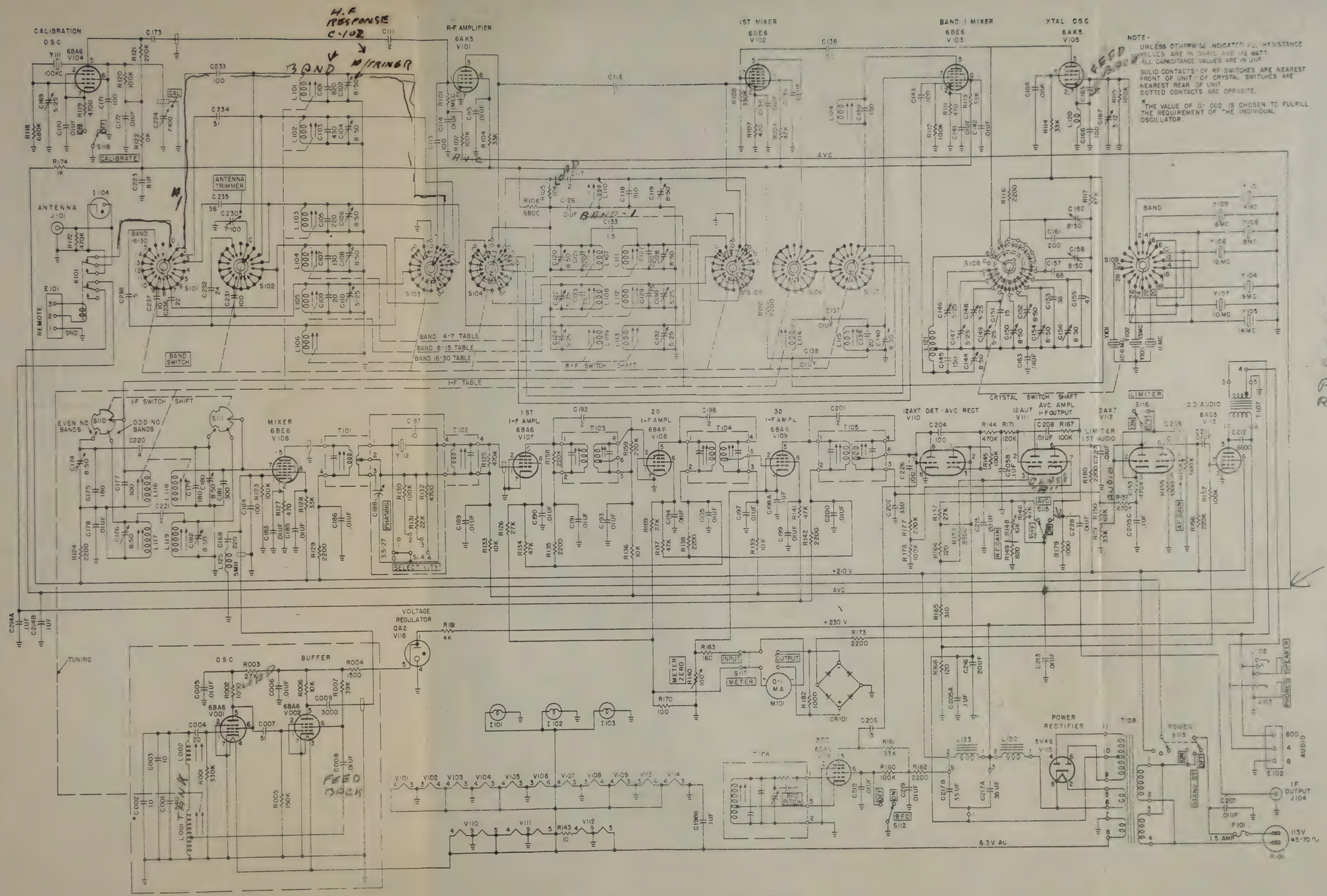
5. *Frequency Shift Exciter O–39/TRA–7, schematic diagram.*



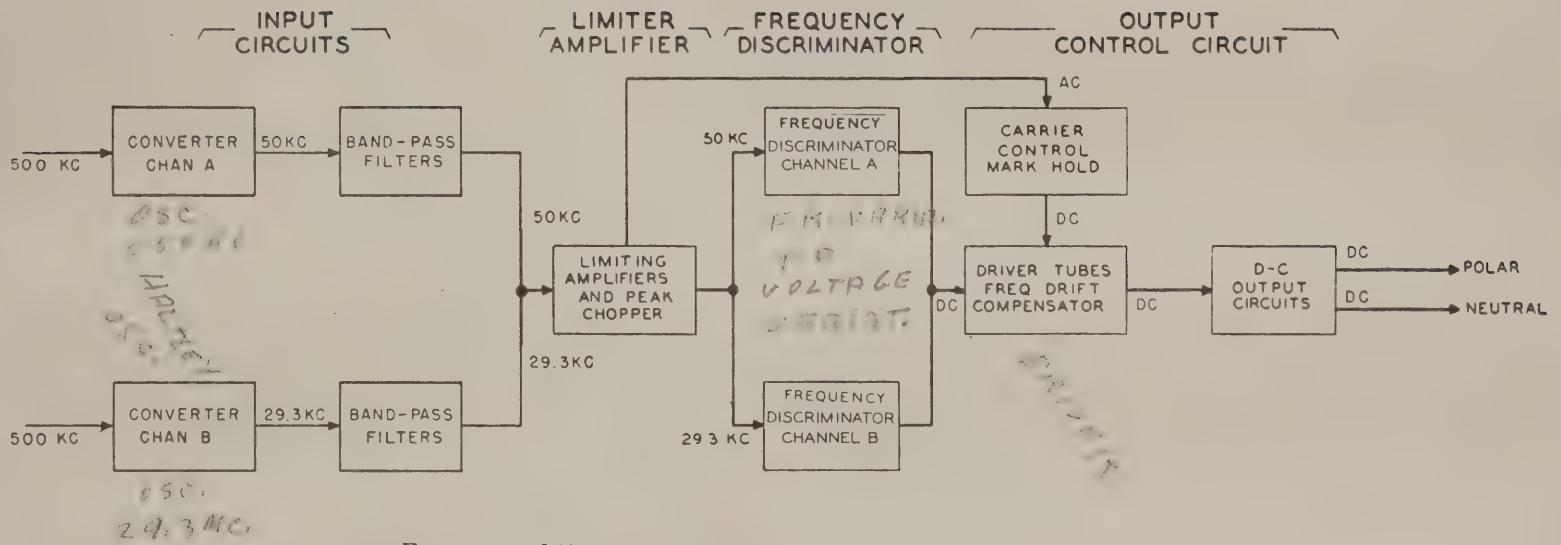
6. *Rectifier RA-87, schematic diagram.*



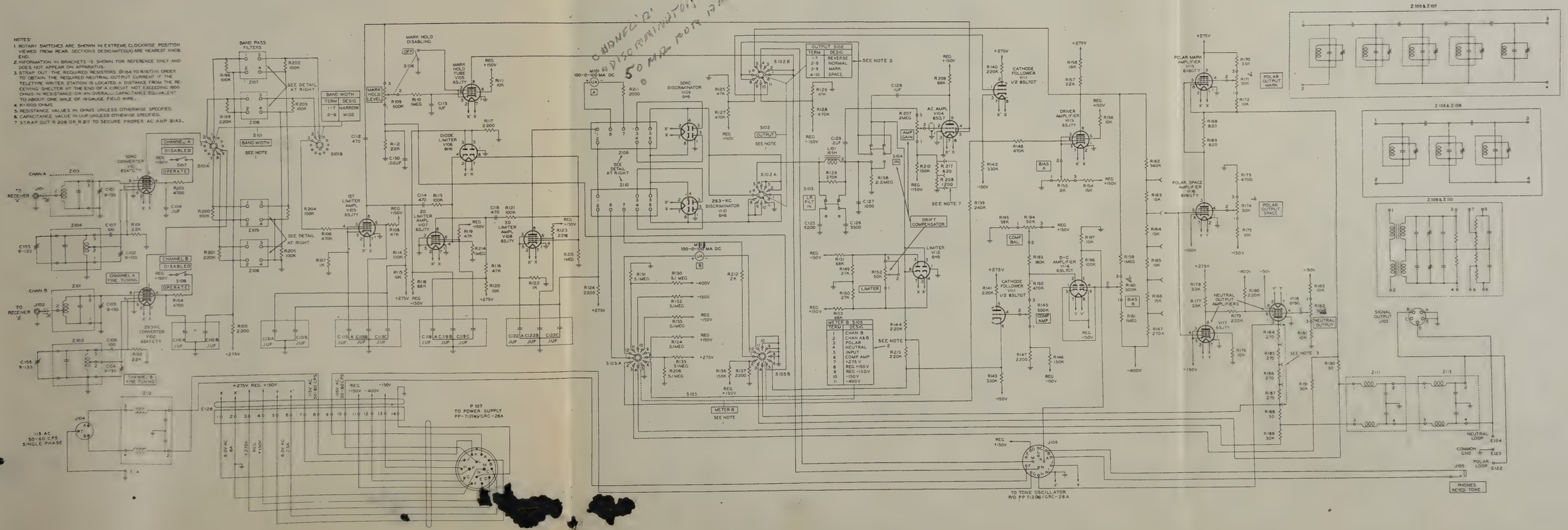
7. *Radio Receiver R–388/URR, over-all block diagram.*



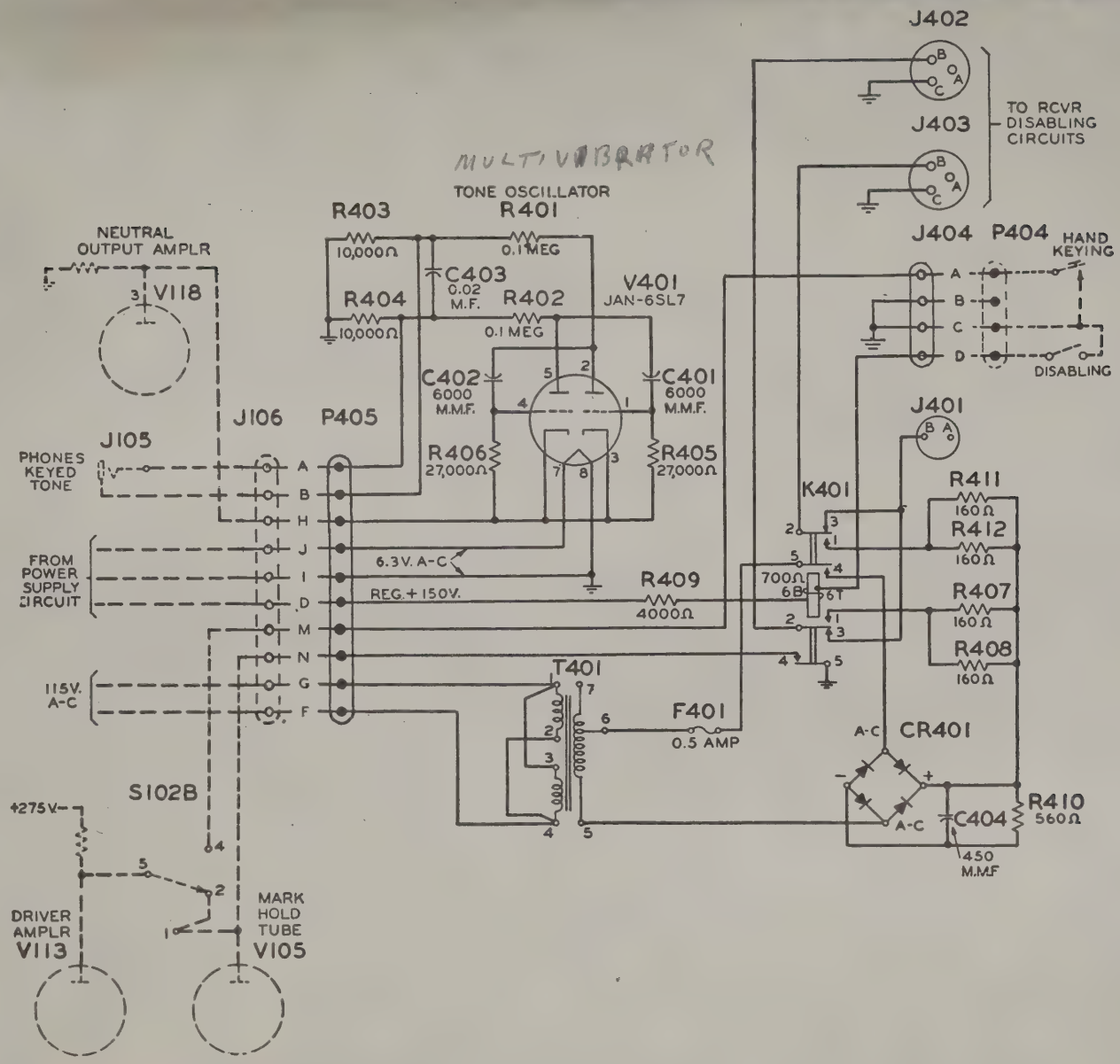
8. *Radio Receiver R-388/URR, schematic diagram.*



9. *Frequency shift converter CV–182 (*)/GRC–26A, block diagram.*


NOTES:
1. ROTARY SWITCHES ARE SHOWN IN EXTREME CLOCKWISE POSITION VIEWED FROM REAR. SECTIONS DESIGNATED(A) ARE NEAREST KNOB END.
2. INFORMATION IN BRACKETS IS SHOWN FOR REFERENCE ONLY AND DOES NOT APPEAR ON APPARATUS.
3. STRAP OUT THE REQUIRED RESISTORS (R184 TO R187) IN ORDER TO OBTAIN THE REQUIRED NEUTRAL OUTPUT CURRENT IF THE TELETYPE WRITER STATION IS LOCATED A DISTANCE FROM THE RECEIVING SHELTER AT THE END OF A CIRCUIT NOT EXCEEDING 1800 OHMS IN RESISTANCE OR AN OVERALL CAPACITANCE EQUIVALENT TO ABOUT ONE MILE OF 19 GAUGE FIELD WIRE.
4. K=1000 OHMS.
5. RESISTANCE VALUES IN OHMS UNLESS OTHERWISE SPECIFIED.
6. CAPACITANCE VALUE IN UUF UNLESS OTHERWISE SPECIFIED.
7. STRAP OUT R 208 OR R 217 TO SECURE PROPER AC AMP BIAS.
BAND PASS FILTERS
BAND WIDTH
TERM DESIG
1-7 NARROW
2-8 WIDE
MARK HOLD DISABLING
MARK HOLD LEVEL
CHANNEL A
CHANNEL B
DISABLED
OPERATE
CHANNEL A FINE TUNING
CHANNEL B FINE TUNING
50KC CONVERTER 6SA7GTY
293 KC CONVERTER V102 6SA7GTY
1ST LIMITER AMPL V103 6SJ7Y
2D LIMITER AMPL V107 6SJ7Y
30 LIMITER AMPL V108 6SJ7Y
DIODE LIMITER V106 6H6
MARK HOLD TUBE V105 6SJ7Y
50KC DISCRIMINATOR V109 6H6
293-KC DISCRIMINATOR V110 6H6
OUTPUT S102
TERM DESIG
1-7 REVERSE
2-8 NORMAL
3-9 MARK
4-10 SPACE
AMP GAIN
AC AMPL V104 6SJ7
CATHODE FOLLOWER V11 1/2 6SL7GT
DRIVER AMPLIFIER V113 6SJ7Y
BIAS A
BIAS B
COMP BAL
COMP AMP
D-C AMPLIFIER V114 6SL7GT
CATHODE FOLLOWER V111 1/2 6SL7GT
DRIFT COMPENSATOR
LIMITER V112 6H6
METER B S105
TERM DESIG
1 CHAN B
2 CHAN A&B
3 POLAR
4 NEUTRAL
5 INPUT
6 COMP AMP
7 +275 V
8 REG +150 V
9 REG -150 V
10 -150 V
11 -400 V
METER B
SEE NOTE
SEE DETAIL AT RIGHT
SEE NOTE 2
SEE NOTE 3
SEE NOTE 7
POLAR MARK AMPLIFIER V115 6V6GTY
POLAR SPACE AMPLIFIER V116 6V6GTY
POLAR OUTPUT MARK
POLAR OUTPUT SPACE
NEUTRAL OUTPUT AMPLIFIERS V117 6SJ7Y V118 6Y6G
NEUTRAL OUTPUT
SIGNAL OUTPUT J103
Z 105 & Z 107
Z 106 & Z 108
Z 108 & Z 110
Z 111
Z 113
NEUTRAL LOOP E124
COMMON GND E123
POLAR LOOP E122
PHONES KEYED TONE
TO RECEIVER X J101
TO RECEIVER G J102
118 AC 50-60 CPS SINGLE PHASE J104
P 107 TO POWER SUPPLY PP-712(W)/GRC-26A
TO TONE OSCILLATOR P/O PP 7126(W)/GRC-26A J106
CHANNEL A
CHANNEL B
POLAR
NEUTRAL
INPUT
COMP AMP
+275 V
REG +150 V
REG -150 V
-150 V
-400 V

10. *Frequency Shift Converter CV-182A/GRC-26A, schematic diagram.*



11. Frequency Shift Converter Tone Oscillator, Simplified Circuit